IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Hammer et al.
Application No. 10/091,039
Filed: March 4, 2002
Confirmation No. 6479
For: APPARATUS AND METHODS FOR MAKING A MASONRY BLOCK WITH A ROUGHENED SURFACE
Examiner: Thukhanh T. Nguyen
Art Unit: 1772
Attorney Reference No. 1342-61338-01

CERTIFICATE OF MAILING

I hereby certify that this paper and the documents referred to as being attached or enclosed herewith are being deposited with the United States Postal Service as First Class Mail in an envelope addressed to: MAIL STOP APPEAL BRIEF-PATENTS, COMMISSIONER FOR PATENTS, P.O. BOX 1450, ALEXANDRIA, VA 22313-1450 on the date shown below.

Attorney for Applicant(s) _____

Date Mailed April 13, 2005

MAIL STOP APPEAL BRIEF- PATENTS
COMMISSIONER FOR PATENTS
P.O. BOX 1450
ALEXANDRIA, VA 22313-1450

APPELLANT'S APPEAL BRIEF

This brief is in furtherance of the Notice of Appeal filed December 13, 2004. Appellants respectfully request consideration of this brief for allowance of the present application.

This brief is submitted with a check for $250.00 to cover the fee for filing an appeal brief.

Please charge any shortages and credit any overcharges to our Deposit Account No. 02-4550.

04/18/2005 EFLORES 00000103 10091039
01 FC:2402 250.00 OP

TABLE OF CONTENTS

I. Real Party in Interest

The real party in interest is Westblock Systems, Inc., an Oregon corporation having a place of business at 1690 Edgewater Drive, Salem, OR 97304. Ownership by Westblock Systems is established as follows:

(i) an Assignment from inventor James Hammer recorded with the U.S. Patent and Trademark Office on Reel 013022, Frames 0032-0034; and

(ii) an Assignment from inventor Llewellyn Johnston and Columbia Machine, Inc., recorded with the U.S. Patent and Trademark Office on Reel 012897, Frames 0171-0176.

II. Related Appeals and Interferences

There are no other appeals or interferences that will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. Status of Claims

Claims 1-39 and 52 are pending in the instant application. Claims 1-39 and 52 were rejected. Claims 40-51 and 53 were canceled. The rejection of claims 1-39 and 52 is the subject of the instant appeal.

IV. Status of Amendments

The Amendment submitted to the Patent Office on November 10, 2004 was not entered into the record.

V. Summary of Claimed Subject Matter

The present application concerns apparatus for creating a roughened surface texture on a masonry block (e.g., a concrete block) by "scraping" or "abrading" one or more surfaces of the block in an uncured state as it is removed from a mold. The roughened surface texture resembles the surface texture of natural stone.

A. Independent Claim 1

Independent claim 1 is directed to an apparatus for molding a masonry block (e.g., apparatus 60 shown in FIGS. 4-6 or apparatus 100 shown in FIG. 7). The apparatus comprises a plurality of walls (e.g., walls 10, 10', 64, 66 in FIGS. 4-6) defining at least one mold cavity (e.g.,

mold cavity 68 in FIGS. 4-6) adapted to receive block-forming material. The mold defines an opening through which a formed uncured block (e.g., block 72 in FIGS. 4-6) may be removed from the mold cavity. At least one of the walls (e.g., walls 10, 10' in FIGS. 1-6) includes a major surface having a plurality of tapered projections (e.g., projections 18 in FIGS. 1-6) that extend into the mold cavity. The projections contact an adjacent surface of the uncured block in the mold cavity, whereby when the uncured block is removed from the mold cavity, the projections texture the adjacent surface of the uncured block. See, e.g., page 6, lines 12-23; page 7, lines 19-29; and page 10, lines 7-19.

B. Independent Claim 11

Independent claim 11 is directed to an apparatus for molding a masonry block (e.g., apparatus 60 shown in FIGS. 4-6 or apparatus 100 shown in FIG. 7). The apparatus comprises a mold (e.g., mold 62 in FIGS. 4-6) including an interior surface defining at least one mold cavity (e.g., mold cavity 68 in FIGS. 4-6). The mold cavity is adapted to receive block-forming material to form an uncured block (e.g., block 72 in FIGS. 4-6) and to allow removal of such block from the mold cavity. The interior surface includes rows of projections (e.g., projections 18 in FIGS. 1-6) that are positioned side-by-side in each row. Each projection has a respective base that adjoins a base of an adjacent projection in the same row, such that when the uncured block is removed from the mold cavity, the projections create a roughened texture on the surface of the uncured block. See, e.g., page 6, lines 12-23; page 7, lines 19-29; page 8, lines 6-20; and page 10, lines 7-19.

C. Independent Claim 20

Independent claim 20 is directed to an apparatus for molding masonry blocks (e.g., apparatus 100 shown in FIG. 7). The apparatus comprises a mold (e.g., mold 102 in FIG. 7) that comprises first and second mold cavities (e.g., mold cavities 106, 108 in FIG. 7) and a separating member (e.g., separating member 110 in FIG. 7) separating the mold cavities. The first and second mold cavities are adapted to receive block-forming material for forming first and second blocks, respectively (e.g., blocks 116, 118 in FIG. 7). The separating member has first and second major surfaces (e.g., surfaces 120, 122 in FIG. 7), the first surface forming an interior surface of the first mold cavity and the second major surface forming an interior surface of the second mold cavity. A plurality of block-texturing members (e.g., members 18 in FIG. 7) are

located on the first and second major surfaces of the separating member. The block-texturing members are configured to produce a roughened texture on adjacent surfaces of the first and second blocks as they are removed from their respective mold cavities. See, e.g., page 10, lines 7-30.

D. Independent Claim 25

Independent claim 25 is directed to an apparatus for molding masonry blocks (e.g., apparatus 100 shown in FIG. 7). The apparatus comprises a mold (e.g., mold 102 in FIG. 7) that comprises a plurality of walls (e.g., walls 10, 10' in FIG. 7) forming first and second mold cavities (e.g., mold cavities 106, 108 in FIG. 7) and a separating member (e.g., separating member 110 in FIG. 7) separating the mold cavities. The first and second mold cavities are adapted to receive block-forming material for forming first and second blocks, respectively (e.g., blocks 116, 118 in FIG. 7). The separating member has first and second major surfaces, the first major surface forming an interior surface of the first mold cavity and the second major surface forming an interior surface of the second mold cavity. A plurality of projections (e.g., projections 18 in FIG. 7) are disposed on at least one of the walls of the mold and extend into the first mold cavity. A plurality of projections (e.g., projections 18 in FIG. 7) are disposed on at least one of the walls of the mold and extend into the second mold cavity. A plurality of projections (e.g., projections 18 in FIG. 7) are disposed on at least one major surface of the separating member and extend into the adjacent mold. When the first and second blocks are removed from the mold, the projections produce at least two roughened surfaces on one of the blocks and at least one roughened surface on the other block. See, e.g., page 10, lines 7-30.

E. Independent Claim 29

Independent claim 29 is directed to a wall for use in a mold for molding a masonry block (e.g., wall 10 in FIGS. 1-7 or wall 110 in FIG. 7). The wall comprises a body (e.g., body 12 in FIGS. 1-3) having first and second major surfaces (e.g., surfaces 14, 16 in FIGS. 1-3), with at least one of the surfaces having a plurality of tapered projections (e.g., projections 18 in FIGS. 1-3). The projections are arranged in rows of projections extending diagonally across the body so as to define grooves between adjacent rows extending diagonally across the body. See, e.g., page 7, lines 19-29 and page 8, lines 6-20.

F. Independent Claim 30

Independent claim 30 is directed to a wall for use in a mold for molding a masonry block (e.g., wall 10 in FIGS. 1-7 or wall 110 in FIG. 7). The wall comprises a body (e.g., body 12 in FIGS. 1-3) having first and second major surfaces (e.g., surfaces 14, 16 in FIGS. 1-3), with at least one of the surfaces having a plurality of frusto-pyramidal projections (e.g., projections 18 in FIGS. 1-3). See, e.g., page 7, line 19 through page 8, line 20.

G. Independent Claim 36

Independent claim 36 is directed to a wall for use in a mold for molding a masonry block (e.g., wall 110 in FIG. 7). The wall comprises a body having first and second major surfaces (e.g., surfaces 120, 122 in FIG. 7) and a plurality of projections (e.g., projections 18 in FIG. 7) extending outwardly from both surfaces. See, e.g., page 10, lines 20-30.

VI. Ground of Rejection to be Reviewed on Appeal

Whether claims 1-39 and 52 are obvious from Japanese Patent Publication No. 2001-191314 to Yoshiyuki (Yoshiyuki) in view of Japanese Patent Publication No. 07-052133 to Yasuo et al. (Yasuo).

VII. Arguments

A. Overview of The Prior Art

1. Japanese Patent No. 2001-191314 to Yoshiyuki (Yoshiyuki)

The following description of Yoshiyuki is based on the figures shown in Yoshiyuki, an English abstract, and a computer-generated translation of the patent provided by the Patent Office. Yoshiyuki is presently understood to disclose a mold 200 for forming concrete blocks. The mold comprises walls 230, which are formed with a plurality of projections 232 and cavities 233 (see FIG. 4). To form a block, the mold is filled with concrete material, which is allowed to harden inside the mold. See paragraph 30 of the Yoshiyuki translation. Also, a heater is used to facilitate curing (hardening) of the block in the mold. See paragraph 32 of the Yoshiyuki translation.

The projections 232 and cavities 233 cast a corresponding surface pattern of similarly shaped projections and cavities on the surface of the cured block while it is still in the mold; that is, a mirror image of the projections and cavities is formed on the surface of the block. See

paragraph 10 of the Yoshiyuki translation. The effect of Yoshiyuki's invention is to provide a concrete block having a "natural aesthetic property which has many concavo-convex patterns on [its] surface." See paragraph 38 of the Yoshiyuki translation.

As evident from FIG. 5 of Yoshiyuki, the walls 230 of the mold are tapered from the top of the mold to the bottom of the mold so that the block has a greater width at the bottom of the block than at the top of the block.[1] Thus, as the block is removed from the mold cavity, a progressively increasing gap is created between the surfaces of the block and the adjacent walls of the mold cavity to facilitate removal of the block from the mold cavity.[2]

2. Japanese Patent No. 07-052133 to Yasuo et al. (Yasuo)

The following description of Yasuo is based on the figures shown in Yasuo and an English abstract.[3] Yasuo is understood to disclose a concrete "embedding form" 1 that is formed with horizontal rows of pyramid shaped projections 2. See FIGS. 1a-1c and abstract. The projections 2 are made of "high compression strength cement." See abstract. The embedding form 1 can be made by providing a "press form" (not shown) having quadrangular recesses and projections and pressing the press form into the surface of embedding form concrete 3 (FIGS. 1b and 1c) to form a mirror image of the projections. See abstract. The purpose of Yasuo's system is to "enhance the integrality with the main body concrete by providing conical projections [on] almost [the] entire surface . . . of [the] main body concrete." See abstract.

B. The 35 U.S.C. § 103(a) Rejection of Claims 1-39 and 52 Should be Withdrawn

Claims 1-39 and 52 stand rejected under 35 U.S.C. § 103(a) as allegedly being obvious from Yoshiyuki in view of Yasuo. For at least the following reasons, these claims are not obvious from the combination of Yoshiyuki and Yasuo.

---

[1] Paragraph 0021 of the Yoshiyuki translation states that "a [wall] 230 consists of plate-like part material to which thickness is becoming thin gradually toward the bottom."
[2] Paragraph 0010 of the Yoshiyuki translation states that "a crevice occurs between a block and an inside of a mold and it can extract comparatively easily."
[3] A computer-generated translation of Yasuo was entered in the record by the Patent Office.

1. Independent Claim 1

Claim 1 recites an apparatus for molding a masonry block comprising a mold. The mold comprises a plurality of walls defining at least one mold cavity adapted to receive block-forming material. The mold defines an opening through which a formed, uncured block may be removed from the mold cavity. At least one of the walls includes a major surface having a plurality of tapered projections that extend into the mold cavity. The projections contact an adjacent surface of the uncured block in the mold cavity, whereby when the uncured block is removed from the mold cavity, the projections texture the adjacent surface of the uncured block.

a. There is No Teaching or Suggestion to Combine Yoshiyuki and Yasuo

In the final Office action dated August 11, 2004 (hereinafter "final action"), the Examiner concedes that Yoshiyuki does not disclose a mold having tapered projections, as recited in claim 1. Page 3 of the final action. But, the Examiner contends that it would have been obvious to modify Yoshiyuki by providing a plurality of pyramidal projections as taught by Yasuo "because the slant surface of the pyramidal shape[d] projections would increase the contacting surface between the mold and the concrete material to improve the integrity of the forming concrete blocks." The Examiner cited paragraphs 0008 and 0012 of Yasuo in support of this contention. Page 3 of the final action.

In the advisory action dated December 1, 2004 (hereinafter "final action"), the Examiner further explains the basis for the rejection. Specifically, the Examiner contends that one would have been motivated to combine Yoshiyuki and Yasuo because forming conical or pyramidal projections in a concrete structure, as shown in Yasuo, would improve the "integrity" or "firmness" of the concrete. Page 2 of the advisory action. In reply, Applicants submit that this contention is speculative and does not support any combination of Yoshiyuki and Yasuo to derive the combination of features recited in claim 1.

Applicants first note that the rejection is based on computer-generated translations of Yoshiyuki and Yasuo, which are published in Japanese. These translations are not true translations of Yoshiyuki and Yasuo, are mostly incomprehensible, and do not provide any motivation for combining the teachings of Yoshiyuki and Yasuo. In particular, there is no teaching or suggestion in the Yasuo translation that casting conical or pyramidal projections in the surface of a concrete structure would improve the integrity or firmness of the concrete, as suggested by the Examiner.

For example, paragraph 0008 of the Yasuo translation (which was cited by the Examiner), states "If the usual thing which gave irregularity as this presser-foot mold is used, the concavo-convex section is sparse, the area of a crevice can manufacture only small remarkable cylinder of a concavo-convex configuration and prismatic form remarkable simple thing as compared with the area of heights, but the integrity with main part concrete is inferior." Another mention of the term "integrity" is found in paragraph 0001, which states "This invention relates to the high laying under-the-ground mold made from precast concrete of integrity with the main part concrete with which the slant face prepared the shape of a positive multiple cone which is the curved surface of a convex, and a positive multiple frustum-like (it is named generically below shape of cone or cone) projection in the plane or the outside all over the abbreviation for the main part concrete." In paragraph 0009, the Yasuo translation further states "This invention is the laying-under-the-ground mold made from precast concrete which prepared a cone-like projection all over the abbreviation for the main part concrete side surface, and made integrity with main part concrete high."

Applicants disagree that a skilled person would interpret the foregoing passages of Yasuo to mean that forming pyramidal or conical projections in a concrete form improves the firmness of the concrete. Since the Yasuo translation is computer generated and is not a true translation, it appears more likely than not that the term "integrity" is not a true translation of the original Japanese term from which it was translated. Applicants submit that these mostly incomprehensible passages from Yasuo do not provide any credible basis for interpreting Yasuo, and therefore do not provide any teaching or suggestion for modifying the Yoshiyuki device. Applicants submit that a proper examination under 37 C.F.R. §1.104 should be based only on accurate translations of the cited prior art references. Furthermore, the firmness or strength of concrete typically depends on the curing conditions (e.g., curing temperature, moisture, etc.) and the type and amount of each component that make up the concrete mix (e.g., the amount of water, cement, sand, aggregate and other fill materials). The Yasuo translation does not mention any of these factors that affect the firmness of concrete.

Even assuming for argument's sake that forming pyramidal projections in a concrete block improves the firmness of the concrete, this does not provide any motivation to combine Yasuo and Yoshiyuki. For example, the Yasuo translation does not explain exactly how or where the concrete embedding form 1 is used. Paragraphs 0001-0003 of the Yasuo translation

indicate that the embedding form 1 may be used under ground.[4] Whatever it is, Yasuo's embedding form 1 does not appear to be a building block for constructing walls, such as shown in Yoshiyuki. While it might be true that Yasuo's technology improves the integrity of a "laying-under-the-ground mold," there is no indication that this technology can or should be used for forming concrete building blocks. For example, paragraph 0019 of the Yasuo translation mentions the use of a "pressure-foot mold" that is pushed against the cement mortar layer 4 to form projections 2 (FIG. 1c). In contrast, Yoshiyuki does not utilize a "pressure-foot mold" to form projections on a block and provides no teaching or suggestion of any manner by which Yoshiyuki could be adapted to include a "pressure-foot mold."

In the final action, the Examiner also contends that it would be possible to modify Yoshiyuki's mold to include the projections shown in Yasuo in order to produce a concrete block that has pyramidal projections formed in the front and back surfaces of the block, which are effective to improve the "integrity" of the block. See page 3 of the final action. However, when building a wall structure (e.g., a partition wall or wall of a building) from concrete blocks such as shown in Yoshiyuki, the front and back surfaces of the blocks form the front and back surfaces of the wall. Since the front and back surfaces of the blocks do not support the weight of the blocks in the wall, it does not appear necessary to improve the "integrity" of the front and back surfaces of the blocks. Thus, a skilled person would not have any motivation to modify the blocks shown in Yoshiyuki in the manner proposed by the Examiner.

Moreover, a concrete block having a flat surface without any projections would have a greater structural integrity than a concrete block with projections, because the projections would be more prone to breaking than a flat surface. Thus, if anything, if a skilled person wanted to improve the structural integrity of Yoshiyuki's block, he would provide the block with flat surfaces rather than surfaces having the projections shown in Yasuo.

The Examiner also contends that because both Yoshiyuki and Yasuo "are related to the forming of concrete blocks, they are combinable." To establish a *prima facie* case of obviousness, the prior art must provide some suggestion or motivation to combine the respective teachings of individual prior art references to derive the claimed combination of features. *Winner International Royalty Corp. v. Wang*, 202 F.3d 1340, 1348, 53 U.S.P.Q.2d, 1580, 1586 (Fed. Cir. 2000); MPEP § 2142. A statement that the prior art references relate to the same

[4] Paragraph 0001 states that the Yasuo "invention relates to the high laying-under-the-ground mold made from precast concrete."

technical field does not satisfy the requirement of showing that there is some teaching, suggestion, or motivation in the prior art to combine the references.

b. Yoshiyuki and Yasuo Teach Away From Claim 1

There is no suggestion to combine or modify a prior art reference if the reference teaches away from making the specific combination of elements recited in a claim. *See Tec Air, Inc. v. Denso Mfg. Mich. Inc.*, 192 F.3d 1353, 1360, 52 U.S.P.Q. 2d 1294, 1298 (Fed. Cir. 1999). "A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be . . . led in a direction divergent from the path that was taken by the Applicant . . . ." *Id.*

Applicants' technology involves a molding apparatus that is configured to form a roughened surface texture on the surface of an uncured block as it is removed from a mold. Both Yoshiyuki and Yasuo teach away from the apparatus recited in claim 1 because both references teach devices for casting a mirror image of a mold wall into the surface of concrete, rather than a device for creating a roughened surface texture on an uncured block as it is removed from a mold.

For example, Yoshiyuki is presently understood to disclose a mold 200 having walls 230, which are formed with a plurality of projections 232 and cavities 233 (see FIG. 4). To form a block, the mold is filled with concrete material, which is allowed to harden inside the mold. See paragraph 30 of the Yoshiyuki translation. Also, a heater is used to facilitate curing (hardening) of the block in the mold. See paragraph 32 of the Yoshiyuki translation. The projections 232 and cavities 233 cast a corresponding surface pattern of similarly shaped projections and cavities on the surface of the cured block while it is still in the mold; that is, a mirror image of the projections and cavities is formed on the surface of the block. See paragraph 10 of the Yoshiyuki translation.

In contrast, the apparatus of claim 1, includes a mold wall with projections that contact a surface of an uncured block in the mold cavity and cause that surface to become textured as it is removed from the mold cavity. Yoshiyuki's teachings of casting a mirror image of the mold wall into the block and removing the block from the mold after it cures run directly counter to the apparatus of claim 1.

Also, Yoshiyuki further teaches away from claim 1 in that the mold walls 230 of Yoshiyuki are tapered at the bottom to form a gap between the block and the mold walls (see FIG. 5b of Yoshiyuki). This facilitates removal of the cured, hardened block from the mold by

minimizing contact between the mold walls and the block as it is removed from the mold. See paragraph 14 of the Yoshiyuki translation. The tapered mold walls 230 are understood to minimize abrading or texturing the surfaces of a block as it is removed from the mold so that the final shape of the block surfaces, as molded by the mold walls, is preserved.

Yasuo likewise teaches away from claim 1. Yasuo is understood to use a mold having a plurality of pyramid-shaped projections. The mold is used to form a mirror image of the pyramids in the surface of a concrete embedding form 1. See FIGS. 1a-1c of Yasuo. Again, Yasuo teaches away from the claimed apparatus, which concerns an apparatus that textures the surface of an uncured block as it is removed from a mold cavity. Also, a block formed by the claimed apparatus has a roughened surface texture that resembles a split block. The surface of Yasuo's concrete embedding form 1 (FIGS. 1b and 1c) clearly does not have a roughened surface texture that looks like the surface of a split block. Instead, Yasuo's concrete form 1, like Yoshiyuki's block, has a surface that mirrors the surface of the mold.

Because both Yoshiyuki and Yasuo teach away from a mold that textures the surface of an uncured block as it is removed from the mold, as recited in claim 1, there is no teaching or suggestion to combine the two references.

c. Yoshiyuki and Yasuo Teach Away From Each Other

MPEP § 2145 (X)(D)(2) states that "It is improper to combine references where the references teach away from their combination." *See also, McGinley v. Franklin Sports Inc.*, 262 F.3d 1339, 1354, 60 U.S.P.Q.2d 1001, 1010 (Fed. Cir. 2001). The pattern of projections 232 and cavities 233 in Yoshiyuki's mold are intended to provide a "natural aesthetic" appearance to the concrete block. See paragraph 38 of the Yoshiyuki translation. In contrast, as shown in FIGS. 1a-1c of Yasuo, the embedding form 1 clearly does not have a "natural aesthetic" appearance. Yasuo teaches away from Yoshiyuki because forming a pattern of pyramidal projections 2, as taught by Yasuo, runs directly counter to Yoshiyuki's requirement of forming a block having a natural looking surface texture. Accordingly, a skilled person would not have combined Yoshyuki and Yasuo.

The disclosures of Yoshiyuki and Yasuo further teach away from their combination because Yoshiyuki mold includes mold walls 230 that are tapered at the bottom to minimize contact between the inside of the mold and the block and therefore allow the block to be removed from the mold. See paragraphs 10, 14 and 31 of the Yoshiyuki translation. On the

other hand, the final action states that the use of the Yasuo device "would increase the contact surface between the mold and the concrete." See page 3 of the final action. It appears that increasing the contacting surface would inhibit the removal of a cured block from a mold. Thus, without the benefit of Applicants' disclosure, which cannot be used in hindsight, one skilled in the art would be led away from combining the disclosures of Yoshiyuki and Yasuo.

The final action states that Yoshiyuki "does not really teach minimizing the contact area" of the mold because "[i]f the contact area between the block and the projections are limited, the blocks will not be formed properly." See page 6 of the final action. Applicants agree that the contact area of Yoshiyuki's mold must be sufficient to cast the projections into the side of the block. Nonetheless, as evident from FIG. 5 of Yoshiyuki, the walls 230 of the mold are tapered from the top of the mold to the bottom of the mold so that the block has a greater width at the bottom of the block than at the top of the block.[5] Thus, as the block is removed from the mold cavity, a progressively increasing gap is created between the surfaces of the block and the adjacent walls of the mold cavity.[6] The creation of this gap as the block is removed from the mold clearly minimizes/reduces contact between the block and the adjacent mold surfaces so as to preserve the shape of the surfaces of the block as it is removed from the mold. As noted above, increasing contact between the block and the adjacent mold surfaces runs directly counter to Yoshiyuki's requirement of creating a gap between the inside surfaces of the mold and the block as it is removed from the mold.

In the advisory action, the Examiner further contends that a block having conical projections can be formed with a mold that is expandable or a mold in which the walls are laterally removable. See page 4 of the advisory action. In reply, Applicants submit that there is no teaching or suggestion in Yoshiyuki or Yasuo for an expandable mold or a mold having laterally removable walls. Furthermore, Yoshiyuki's mold 200 includes multiple mold cavities separated by walls 230 for forming multiple blocks in one cycle. See FIG. 3. It does not appear that the mold 200 can be expanded or that walls 230 can be removed laterally to permit removal of the blocks from the mold cavities.

[5] Paragraph 0021 of the Yoshiyuki translation states that "a [wall] 230 consists of plate-like part material to which thickness is becoming thin gradually toward the bottom."
[6] Paragraph 0010 of the Yoshiyuki translation states that "a crevice occurs between a block and an inside of a mold and it can extract comparatively easily."

d. The Combination of Yoshiyuki and Yasuo Would Render Yoshiyuki Unsatisfactory For Its Intended Purpose

MPEP § 2143.01 states that references cannot be combined if the proposed modification would render the prior art device unsatisfactory for its intended purpose. *See also, McGinley*, 262 F.3d at 354, 60 U.S.P.Q.2d at 1010. As discussed above, the Yoshiyuki mold is configured such that moving the cured block downwardly relative to the mold, a "crevice" or gap is created between the block and the inside of the mold to permit extraction of the block from the mold. The projections 232 are understood to be 2-7 mm in height.[7]

The device used to form Yasuo's embedding form 1 does not appear to lend itself for use with the Yoshiyuki mold. For example, the size of the projections 2 relative to the overall size of the embedding form 1 appears to be much larger the relative size of the projections formed by Yoshiyuki's mold. Also, as conceded by the Examiner, the projections on Yasuo's embedding form have "slant surfaces to increase the contacting surface at each projection." See pages 6-7 of the final action. Applicants submit that the much larger projections of Yasuo would appear to inhibit and possibly prevent the extraction of a block from Yoshiyuki's mold, and therefore would render Yoshiyuki's mold unsatisfactory (and possibly inoperable) for its intended purpose. Hence, there is no motivation to combine Yoshiyuki and Yasuo.

The Examiner contends that because Yoshiyuki and Yasuo concern "two different limitations," the references do not teach away from each other. Specifically, the Examiner contends that Yasuo teaches "that the projections [have] slant surfaces to increase the contacting surface at each projection so that **less compression force is required** (emphasis in original)" and that this requirement does not teach away from Yoshiyuki's requirement of using tapered molds. See pages 4-5 of the advisory action. First, Applicants cannot find any support in the Yasuo translation that indicates that the slant surfaces of the projections reduce the required "compression force." Second, the Examiner does not explain what is meant by "less compression force is required" or why this feature of Yasuo is not inconsistent with the teachings of Yoshiyuki.

The Examiner also contends that "It has also been well known in the molding art that the molded product takes the shape of the mold; therefore in order to form a product having conical projections on its surface, the mold surface should also have conical projections." The Examiner

[7] Paragraph 21 of the Yoshiyuki translation states that "the height of [projections] 232 or the depth of a cavity 233 has 2-7 desirablemm."

further contends that "There is no invention in merely changing the shape or form of an article without changing its function except in a design patent." Page 3 of the advisory action (citing *Eskimo Pie Corp. v. Levous*, 35 F. 2d 120, 3 U.S.P.Q. 23 (3rd Cir. 1929) and *In re Dailey*, 357 F.2d 669, 149 U.S.P.Q. 47 (C.C.P.A. 1966)).

Applicants agree that it is well known that a molded product takes the shape of its mold. However, as discussed above, Yoshiyuki's mold does not appear capable of molding a block having the projections 2 of Yasuo's embedding form 1. Moreover, under MPEP § 2144, "the examiner must apply the law consistently to each application after considering all the relevant facts" and may rely on legal precedent only "if the facts in a prior legal decision are sufficiently similar to those in an application under examination." The *Eskimo Pie* and *Dailey* cases involve the patentability of claims directed to a product, not an apparatus for making a product. Because these cases are not factually similar to the present case, they do not provide a basis for establishing a *prima facie* case of obviousness.

Accordingly, for at least the foregoing reasons, claim 1 is not obvious from any combination of Yoshiyuki and Yasuo, and the rejection of claim 1 should be withdrawn.

2. Dependent Claim 2

Claim 2 depends from claim 1 and therefore is allowable along with claim 1 for all the reasons discussed above regarding claim 1. In addition, claim 2 further recites that the projections are generally frusto-pyramidal in shape. FIGS. 1-3 of the present application show frusto-pyramidal projections 18. Each projection 18 has a square base 28, a square end surface 30, and flat side surfaces 20, 22, 24, and 26 that converge from the base to the end surface 30. Such projections provide a more consistent texture across the surface of the block. Another advantage of frusto-pyramidal projections is that the projections do not wear as quickly as projections that taper to a common point at their respective ends (e.g., pyramidal projections). In addition, it is also relatively easier to machine frusto-pyramidal projections into a mold wall compared to machining pyramidal projections into a mold wall.

Neither Yauso nor Yoshiyuki teaches or suggests a mold wall having a plurality of frusto-pyramidal projections, as recited in claim 2. Because Yasuo and Yoshiyuki do not concern devices for texturing the surface of an uncured block, they inherently do not address the need or desirability of providing frutso-pyramidal projections.

3. Dependent Claim 6

Claim 6 depends from claim 1 and therefore is allowable for all the reasons discussed above regarding claim 1. In addition, claim 6, in combination with claim 5, further recites that at least one of said walls comprises a separating wall separating the mold into first and second mold cavities for forming first and second blocks, respectively. The separating wall has first and second major surfaces. The first major surface has a plurality of projections extending into the first mold cavity for texturing a surface of the first block. The second major surface has a plurality of projections extending into the second mold cavity for texturing a surface of the second block.

The Examiner has not explained with any specificity as to why Yoshiyuki in view of Yasuo would have suggested the apparatus recited in claim 6. Hence, the Examiner has not produced a *prima facie* case of obviousness of claim 6, as required under MPEP § 2142.

In any event, Applicants note that unlike claim 6, Yoshiyuki's mold is understood to include projections 232 on only one side of mold walls 230. See FIG. 5 of Yoshiyuki. Thus, Yoshiyuki, as presently understood, does not satisfy the limitations of claim 6. Yasuo does not make up for the deficiencies of Yoshiyuki. Yasuo is understood to use a mold that has projections on one surface thereof for casting a mirror image of the projections into the surface of the embedding form 1. Yasuo does not provide any teaching or suggestion of any manner for modifying Yoshiyuki to derive the claimed combination of features.

4. Dependent Claim 9

Claim 9 depends from claim 1 and therefore is allowable along with claim 1 for all the reasons discussed above regarding claim 1. In addition, claim 9 further recites that "said at least one wall is generally vertical" and "each projection has two generally upwardly facing side surfaces and two generally downwardly facing side surfaces." Unlike claim 9, in the embedding form 1 shown in FIG. 1a of Yasuo, each projection 2 has one upwardly facing surface and one downwardly facing surface. In the embedding form 1 shown in FIG. 2a of Yasuo, each projection 2 has either one upwardly facing surface and two downwardly facing surfaces or two upwardly facing surfaces and one downwardly facing surface. Yoshiyuki does not make up for the deficiencies of Yasuo.

Regarding the orientation of the projections, the Examiner contends that "it has been held that by merely shifting the position of the parts without changing the operation of the mechanism

will not render the claims patentable and the placement of the mechanism is an obvious matter of design choice." See page 4 of the final action (citing *In re Japikse*, 181 F.2d 1019, 86 U.S.P.Q. 70 (C.C.P.A. 1950) and *In re Kuhle*, 526 F.2d 553, 188 U.S.P.Q. 7 (C.C.P.A. 1975)).

Applicants disagree that the specific positioning the projections as recited in the claim 9 is merely a matter of design choice because the positioning of the projections affects the final surface texture of the block. By positioning the sides of the projections in the manner recited in claims 9, the mold can achieve a more consistent and desired texture across the block surface that is textured by the projections. As can be appreciated, the positioning of the projections affects the operation of the apparatus in that it improves the surface texture of the block. The effect that is achieved by the projections would not have been obvious from Yoshiyuki and Yasuo.

5. Dependent Claim 10

Claim 10 depends from claims 1 and 9 and therefore is allowable for all the reasons discussed above regarding claims 1 and 9. In addition, claim 10, in combination with claim 9, further recites that "the two generally upwardly facing side surfaces of each projection have slopes as measured from the vertical that are less than the slopes of the two generally downwardly facing side surfaces." Unlike claim 10, the projections 2 of Yasuo's embedding form 1 have surfaces that appear to have the same slope as measured from the vertical.

In regards to the slope of the projection surfaces, the Examiner states that "the JP'133 [Yasuo] has recognized that a slant face redistributes the compression force and increase[s] shear strength (§ 0012-0014); thus, it would have been obvious . . . to modify the JP'314 [Yoshiyuki] by providing a larger slant surface in the compression direction to reduce stress concentration on the surface of the concrete blocks." See page 4 of the final action. Nowhere in the Yasuo translation is there any basis for the statement that "a slant face redistributes the compression force and increases shear strength."[8]

Even assuming for argument's sake that Yasuo teaches "that a slant face redistributes the compression force and increases shear strength," as Yasuo is presently understood, there is no disclosure in the Yasuo translation that concerns increasing or decreasing the slope of the

[8] For example, paragraph 0012 of the Yasuo translation states "touch area with main part concrete or --since it is not only large, but it is suitable in the directions where contact surface is various and shearing stress in a joint can be distributed in the various directions, shear strength can be raised greatly."

projections to affect the compression or shear strength of the surface of the block. Moreover, this does not address why it would be desirable to provide projections having surfaces that are sloped at different angles.

6. Independent Claim 11

Independent claim 11 is directed to an apparatus for molding a masonry block. The apparatus comprises a mold including an interior surface defining at least one mold cavity. The mold cavity is adapted to receive block-forming material to form an uncured block and to allow removal of such block from the mold cavity. The interior surface includes rows of projections that are positioned side-by-side in each row. Each projection has a respective base that adjoins a base of an adjacent projection in the same row, such that when the uncured block is removed from the mold cavity, the projections create a roughened texture on the surface of the uncured block. Neither Yoshiyuki nor Yasuo (either alone or in combination) teaches or suggests the apparatus recited in claim 11.

In view of certain similarities of claim 11 with claim 1, claim 11 is allowable over any combination of Yoshiyuki and Yasuo for the reasons discussed above pertaining to claim 1. For example, as discussed above, the Examiner contends that one would have been motivated to combine Yoshiyuki and Yasuo because forming conical or pyramidal projections in a concrete structure, as shown in Yasuo, would improve the "integrity" or "firmness" of the concrete. Page 2 of the advisory action. Applicants submit that because the Yasuo translation is mostly incomprehensible, it does not support such an interpretation of Yasuo or provide any credible basis for combining Yoshiyuki and Yasuo. Furthermore, the firmness or strength of concrete typically depends on the curing conditions (e.g., curing temperature, moisture, etc.) and the type and amount of each component that make up the concrete mix (e.g., the amount of water, cement, sand, aggregate and other fill materials). The Yasuo translation does not mention any of these factors that affect the firmness of concrete.

Moreover, the pattern of projections 232 and cavities 233 in Yoshiyuki's mold are intended to provide a "natural aesthetic" appearance to the concrete block. See paragraph 38 of the Yoshiyuki translation. In contrast, as shown in FIGS. 1a-1c in Yasuo, the embedding form 1 clearly does not have a natural aesthetic appearance. Yasuo teaches away from Yoshiyuki because forming a pattern of pyramidal projections 2, as taught by Yasuo, runs directly counter to Yoshiyuki's requirement of forming a block having a natural looking surface texture.

The disclosures of Yoshiyuki and Yasuo further teach away from their combination because Yoshiyuki mold includes mold walls 230 that are tapered at the bottom to minimize contact between the inside of the mold and the block and therefore allow the block to be removed from the mold. See paragraphs 10, 14 and 31 of the Yoshiyuki translation. On the other hand, the final action states that the use of the Yasuo device "would increase the contact surface between the mold and the concrete." See page 3 of the final action. Applicants submit that modifying Yoshiyuki's mold so as to form the pattern of projections shown in Yasuo on a block would appear to inhibit and possibly prevent the extraction of the block from Yoshiyuki's mold, and therefore would render Yoshiyuki's mold unsatisfactory (and possibly inoperable) for its intended purpose. Hence, there is no motivation to combine Yoshiyuki and Yasuo.

Accordingly, for at least the foregoing reasons, claim 11 is not obvious from any combination of Yoshiyuki and Yasuo, and the rejection of claim 11 should be withdrawn.

7. Dependent Claim 18

Claim 18 depends from claim 11 and therefore is allowable for all the reasons discussed above regarding claim 11. In addition, claim 18 further recites that "the rows of projections extend diagonally across the interior surface of the mold so as to define diagonally extending grooves between adjacent rows of projections." For example, as shown in FIGS. 1 and 3 of the present application, a plurality of V-shaped channels or grooves extend diagonally across the surface of the mold. Unlike claim 18, Yasuo's embedding form 1 has horizontal rows and vertical columns of projections 2 which define a plurality of V-shaped channels or grooves extending horizontally between the side edges of the form 1 and grooves extending vertically between the top and bottom edges of the form 1 (a "checkerboard" pattern of projections).

By arranging the projections in diagonal rows, such as shown in FIG. 1 of the present application, rather than in horizontal rows and vertical columns, contact between the projections and the adjacent block surface upon removal of the block from the mold is maximized. As a result, the projections are able to create a random roughened textured across the entire surface of the block. In contrast, if Yasuo's mold were to be used in Yoshiyuki's mold to roughen a surface of an uncured block, the projections would not contact the block surface between the vertical columns of projections. Consequently, Yasuo's mold would create a pattern of alternating columns of roughened and unroughened portions of concrete (the block surface would be roughened only where it contacts the vertical columns of projections, but not between the

projections). Hence, unlike claim 18, Yasuo's mold is not capable of creating a random roughened surface texture across the entire surface of a block.

In addition, arranging the projections in diagonal rows, such as shown in FIG. 1 of the present application, rather than in horizontal rows and vertical columns, is advantageous in that it minimizes the retention of block-forming material on the surface of the mold when an uncured block is removed from the mold. With Yasuo's mold, block-forming material would accumulate in the horizontal and vertical channels between the projections, and therefore would require frequent cleaning.

The Examiner contends that claim 18 is obvious because "It has been held that by merely shifting the position of the parts without changing the operation of the mechanism will not render the claims patentable and the placement of the mechanism is an obvious matter of design choice." See page 4 of the final action (citing *In re Japikse*, 181 F.2d 1019, 86 U.S.P.Q. 70 (C.C.P.A. 1950) and *In re Kuhle*, 526 F.2d 553, 188 U.S.P.Q. 7 (C.C.P.A. 1975)). Applicants disagree with this contention. As discussed above, the specific orientation of the projections in claim 18 affects the operation of the apparatus in that it is capable of producing a random roughened surface texture across the entire surface of a block and minimizes the retention of block-forming material on the surface of the mold when an uncured block is removed from the mold. Because Yoshiyuki and Yasuo do not concern devices for texturing the surface of an uncured block, they inherently do not address any need or desirably for arranging the projections in the manner recited in claim 18. In this regard, the orientation of the projections clearly is not merely "an obvious matter of design choice."

8. Independent Claim 20

Independent claim 20 is directed to an apparatus for molding masonry blocks. The apparatus comprises a mold that comprises first and second mold cavities and a separating member separating the mold cavities. The first and second mold cavities are adapted to receive block-forming material for forming first and second blocks, respectively. The separating member has first and second major surfaces, the first surface forming an interior surface of the first mold cavity and the second major surface forming an interior surface of the second mold cavity. A plurality of block-texturing members are located on the first and second major surfaces of the separating member. The block-texturing members are configured to produce a roughened texture on adjacent surfaces of the first and second blocks as they are removed from their

respective mold cavities. Neither Yoshiyuki nor Yasuo (either alone or in combination) teaches or suggests the apparatus recited in claim 20.

In view of certain similarities of claim 20 with claim 1, claim 20 is allowable over any combination of Yoshiyuki and Yasuo for the reasons discussed above pertaining to claim 1. For example, as discussed above, the Examiner contends that one would have been motivated to combine Yoshiyuki and Yasuo because forming conical or pyramidal projections in a concrete structure, as shown in Yasuo, would improve the "integrity" or "firmness" of the concrete. Page 2 of the advisory action. Applicants submit that because the Yasuo translation is mostly incomprehensible, it does not support such an interpretation of Yasuo or provide any credible basis for combining Yoshiyuki and Yasuo. Furthermore, the firmness or strength of concrete typically depends on the curing conditions (e.g., curing temperature, moisture, etc.) and the type and amount of each component that make up the concrete mix (e.g., the amount of water, cement, sand, aggregate and other fill materials). The Yasuo translation does not mention any of these factors that affect the firmness of concrete.

Moreover, the pattern of projections 232 and cavities 233 in Yoshiyuki's mold are intended to provide a "natural aesthetic" appearance to the concrete block. See paragraph 38 of the Yoshiyuki translation. In contrast, as shown in FIGS. 1a-1c in Yasuo, the embedding form 1 clearly does not have a natural aesthetic appearance. Yasuo teaches away from Yoshiyuki because forming a pattern of pyramidal projections 2, as taught by Yasuo, runs directly counter to Yoshiyuki's requirement of forming a block having a natural looking surface texture.

The disclosures of Yoshiyuki and Yasuo further teach away from their combination because Yoshiyuki mold includes mold walls 230 that are tapered at the bottom to minimize contact between the inside of the mold and the block and therefore allow the block to be removed from the mold. See paragraphs 10, 14 and 31 of the Yoshiyuki translation. On the other hand, the final action states that the use of the Yasuo device "would increase the contact surface between the mold and the concrete." See page 3 of the final action. Applicants submit that modifying Yoshiyuki's mold so as to form the pattern of projections shown in Yasuo on a block would appear to inhibit and possibly prevent the extraction of the block from Yoshiyuki's mold, and therefore would render Yoshiyuki's mold unsatisfactory (and possibly inoperable) for its intended purpose. Hence, there is no motivation to combine Yoshiyuki and Yasuo.

Accordingly, for at least the foregoing reasons, claim 20 is not obvious from any combination of Yoshiyuki and Yasuo, and the rejection of claim 20 should be withdrawn.

9. Dependent Claim 21

Claim 21 depends from claim 20 and therefore is allowable for all the reasons discussed above regarding claim 20. In addition, claim 21 further recites that "the block-texturing members are positioned side-by-side in rows of block-texturing members along the first and second major surfaces of the separating member." Neither Yoshiyuki nor Yasuo (either alone or in combination) teaches or suggests the combination of features recited in claim 21.

10. Dependent Claim 22

Claim 22 depends from claim 20 and therefore is allowable for all the reasons discussed above regarding claim 20. In addition, claim 22 further recites that "the block-texturing members are generally frusto-pyramidal in shape." Neither Yoshiyuki nor Yasuo (either alone or in combination) teaches or suggests the combination of features recited in claim 22.

11. Dependent Claim 23

Claim 23 depends from claim 20 and therefore is allowable for all the reasons discussed above regarding claim 20. In addition, claim 23 further recites that "the block-texturing members are generally pyramidal in shape." Neither Yoshiyuki nor Yasuo (either alone or in combination) teaches or suggests the combination of features recited in claim 23.

12. Independent Claim 25

Independent claim 25 is directed to an apparatus for molding masonry blocks. The apparatus comprises a mold that comprises a plurality of walls forming first and second mold cavities and a separating member separating the mold cavities. The first and second mold cavities are adapted to receive block-forming material for forming first and second blocks, respectively. The separating member has first and second major surfaces, the first major surface forming an interior surface of the first mold cavity and the second major surface forming an interior surface of the second mold cavity. A plurality of projections are disposed on at least one of the walls of the mold and extend into the first mold cavity. A plurality of projections are disposed on at least one of the walls of the mold and extend into the second mold cavity. A plurality of projections are disposed on at least one major surface of the separating member and extend into the adjacent mold cavity. When the first and second blocks are removed from the

mold, the projections produce at least two roughened surfaces on one of the blocks and at least one roughened surface on the other block. Neither Yoshiyuki nor Yasuo (either alone or in combination) teaches or suggests the apparatus recited in claim 25.

In view of certain similarities of claim 25 with claim 1, claim 25 is allowable over any combination of Yoshiyuki and Yasuo for the reasons discussed above pertaining to claim 1. For example, as discussed above, the Examiner contends that one would have been motivated to combine Yoshiyuki and Yasuo because forming conical or pyramidal projections in a concrete structure, as shown in Yasuo, would improve the "integrity" or "firmness" of the concrete. Page 2 of the advisory action. Applicants submit that because the Yasuo translation is mostly incomprehensible, it does not support such an interpretation of Yasuo or provide any credible basis for combining Yoshiyuki and Yasuo. Furthermore, the firmness or strength of concrete typically depends on the curing conditions (e.g., curing temperature, moisture, etc.) and the type and amount of each component that make up the concrete mix (e.g., the amount of water, cement, sand, aggregate and other fill materials). The Yasuo translation does not mention any of these factors that affect the firmness of concrete.

Moreover, the pattern of projections 232 and cavities 233 in Yoshiyuki's mold are intended to provide a "natural aesthetic" appearance to the concrete block. See paragraph 38 of the Yoshiyuki translation. In contrast, as shown in FIGS. 1a-1c in Yasuo, the embedding form 1 clearly does not have a natural aesthetic appearance. Yasuo teaches away from Yoshiyuki because forming a pattern of pyramidal projections 2, as taught by Yasuo, runs directly counter to Yoshiyuki's requirement of forming a block having a natural looking surface texture.

The disclosures of Yoshiyuki and Yasuo further teach away from their combination because Yoshiyuki mold includes mold walls 230 that are tapered at the bottom to minimize contact between the inside of the mold and the block and therefore allow the block to be removed from the mold. See paragraphs 10, 14 and 31 of the Yoshiyuki translation. On the other hand, the final action states that the use of the Yasuo device "would increase the contact surface between the mold and the concrete." See page 3 of the final action. Applicants submit that modifying Yoshiyuki's mold so as to form the pattern of projections shown in Yasuo on a block would appear to inhibit and possibly prevent the extraction of the block from Yoshiyuki's mold, and therefore would render Yoshiyuki's mold unsatisfactory (and possibly inoperable) for its intended purpose. Hence, there is no motivation to combine Yoshiyuki and Yasuo.

Accordingly, for at least the foregoing reasons, claim 25 is not obvious from any combination of Yoshiyuki and Yasuo, and the rejection of claim 25 should be withdrawn.

13. Dependent Claim 26

Claim 26 depends from claim 25 and therefore is allowable for all the reasons discussed above regarding claim 25. In addition, claim 26 further recites that "each projection has two generally upwardly facing side surfaces and two generally downwardly facing side surfaces." Unlike claim 25, in the embedding form 1 shown in FIG. 1a of Yasuo, each projection 2 has one upwardly facing surface and one downwardly facing surface. In the embedding form 1 shown in FIG. 2a of Yasuo, each projection 2 has either one upwardly facing surface and two downwardly facing surfaces or two upwardly facing surfaces and one downwardly facing surface.

14. Dependent Claim 27

Claim 27 depends from claims 25 and 26 and therefore is allowable for all the reasons discussed above regarding claims 25 and 26. In addition, claim 27, in combination with claim 26, further recites that "the two generally upwardly facing side surfaces of each projection have slopes that are less than the slopes of the two generally downwardly facing side surfaces." Unlike claim 27, the projections 2 of Yasuo's embedding form 1 have surfaces that appear to have the same slope.

15. Dependent Claim 28

Claim 28 depends from claim 25 and therefore is allowable for all the reasons discussed above regarding claim 25. In addition, claim 28 further recites that a plurality of projections are disposed on both the first and second major surfaces of the separating member.

The Examiner has not explained with any specificity as to why Yoshiyuki in view of Yasuo would have suggested the apparatus recited in claim 28. Hence, the Examiner has not produced a *prima facie* case of obviousness of claim 28, as required under MPEP § 2142.

In any event, Applicants note that unlike claim 28, Yoshiyuki's mold is understood to include projections 232 on only one side of mold walls 230. See FIG. 5 of Yoshiyuki. Thus, Yoshiyuki, as presently understood, does not satisfy the limitations of claim 28. Yasuo does not make up for the deficiencies of Yoshiyuki. Yasuo is understood to use a mold that has projections on one surface thereof for casting a mirror image of the projections into the surface

of the embedding form 1. Yasuo does not provide any teaching or suggestion of any manner for modifying Yoshiyuki to derive the claimed combination of features.

16. Independent Claim 29

Independent claim 29 is directed to a wall for use in a mold for molding a masonry block. The wall comprises a body having first and second major surfaces, with at least one of the surfaces having a plurality of projections. The projections taper as they extend away from the body and are arranged in rows of projections extending diagonally across the body so as to define grooves between adjacent rows extending diagonally across the body. Neither Yoshiyuki nor Yasuo (either alone or in combination) teaches or suggests the wall recited in claim 29.

Unlike claim 29, Yasuo's embedding form 1 has horizontal rows and vertical columns of projections 2 which define a plurality of V-shaped grooves extending horizontally between the side edges of the form 1 and vertical grooves extending between the top and bottom edges of the form 1.

By arranging the projections in diagonal rows, such as shown in FIG. 1 of the present application, rather than in horizontal rows and vertical columns, contact between the projections and the adjacent block surface upon removal of the block from the mold is maximized. As a result, the projections are able to create a random roughened textured across the entire surface of the block. In contrast, if Yasuo's mold were to be used in Yoshiyuki's mold to roughen a surface of an uncured block, the projections would not contact the block surface between the vertical columns of projections. Consequently, Yasuo's mold would create a pattern of alternating columns of roughened and unroughened portions of concrete (the block surface would be roughened only where it contacts the vertical columns of projections, but not between the projections). Hence, unlike claim 29, Yasuo's mold is not capable of creating a random roughened surface texture across the entire surface of a block.

In addition, arranging the projections in diagonal rows, such as shown in FIG. 1 of the present application, rather than in horizontal rows and vertical columns, is advantageous in that it minimizes the retention of block-forming material on the surface of the wall when an uncured block is removed from the mold. With Yasuo's mold, block-forming material would accumulate in the horizontal and vertical channels between the projections, and therefore would require frequent cleaning.

The Examiner contends that claim 29 is obvious because "It has been held that by merely shifting the position of the parts without changing the operation of the mechanism will not render the claims patentable and the placement of the mechanism is an obvious matter of design choice." See page 4 of the final action (citing *In re Japikse*, 181 F.2d 1019, 86 U.S.P.Q. 70 (C.C.P.A. 1950) and *In re Kuhle*, 526 F.2d 553, 188 U.S.P.Q. 7 (C.C.P.A. 1975)). Applicants disagree with this contention. As discussed above, the specific orientation of the projections in claim 29 affects the operation of the wall when used in a mold in that it is capable of producing a random roughened surface texture across the entire surface of a block and minimizes the retention of block-forming material on the wall when an uncured block is removed from the mold.

Because Yasuo and Yoshiyuki are used to cast a pattern of projections into a concrete form, not for "scraping" the surface of an uncured block, Yasuo and Yoshiyuki are completely silent on any need or desirability of arranging the projections in diagonal rows to minimize the retention of block-forming material and to create a roughened surface texture across the entire surface of a block. In this regard, the orientation of the projections clearly is not merely "an obvious matter of design choice."

Accordingly, claim 29 is not obvious from any combination of Yoshiyuki and Yasuo, and the rejection of claim 29 should be withdrawn.

17. Independent Claim 30

Independent claim 30 is directed to a wall for use in a mold for molding a masonry block. The wall comprises a body having first and second major surfaces, with at least one of the surfaces having a plurality of tapered projections. Claim 30 also specifies that the projections are frusto-pyramidal in shape.

The instantly claimed projections are advantageous in that they provide a more consistent texture across the surface of the block. Another advantage of frusto-pyramidal projections is that the projections do not wear as quickly as projections that taper to a common point at their respective ends (e.g., pyramidal projections). In addition, it is also relatively easier to machine frusto-pyramidal projections into a mold wall compared to machining pyramidal projections into a mold wall.

Neither Yauso nor Yoshiyuki teaches or suggests a mold wall having a plurality of frusto-pyramidal projections, as recited in claim 30. Because Yasuo and Yoshiyuki do not concern

devices for texturing the surface of an uncured block, they inherently do not address the need or desirability of providing frutso-pyramidal projections. Accordingly, claim 30 is not obvious from any combination of Yoshiyuki and Yasuo, and the rejection of claim 30 should be withdrawn.

18. Dependent Claim 33

Claim 33 depends from claim 29 and therefore is allowable for all the reasons discussed above regarding claim 29. In addition, claim 33 further recites that "each projection has a first side surface and a second side surface, the first side surface having a slope that is greater than the slope of the second side surface." Unlike claim 33, the projections 2 of Yasuo's embedding form 1 have surfaces that appear to have the same slope.

19. Independent Claim 36

Independent claim 36 is directed to a wall for use in a mold for molding a masonry block. The wall comprises a body having first and second major surfaces and a plurality of projections extending outwardly from both surfaces. FIG. 7 of the present application shows a mold wall 110 having projections 18 on opposing surfaces and extending into first and second mold cavities 106, 108. By providing projections on both surfaces of the wall 110, roughened surfaces can be formed on the surfaces of two separate blocks 116, 118 using a single mold.

Under MPEP § 2142, the examiner bears the burden of establishing a prima *facie case* of obviousness by showing that there is some suggestion or motivation in the prior art to modify or combine references. In the present case, the Examiner has not explained with any specificity as to why Yoshiyuki in view of Yasuo would have suggested the wall recited in claim 36. Consequently, the Examiner has not produced a *prima facie* case of obviousness of claim 36.

In any event, Applicants note that unlike claim 36, Yoshiyuki's mold is understood to include projections 232 on only one side of mold walls 230. See FIG. 5 of Yoshiyuki. Yasuo is understood to use a mold that has projections on one surface thereof for casting a mirror image of the projections into the surface of the embedding form 1. Yasuo does not provide any teaching or suggestion of any manner for modifying Yoshiyuki to derive the claimed combination of features.

20. Dependent Claim 38

Claim 38 depends from claim 36 and therefore is allowable for all the reasons discussed above regarding claim 36. In addition, claim 36 further recites that the projections are tapered. Neither Yauso nor Yoshiyuki (either alone or in combination) teaches or suggests a mold wall having tapered projections on first and second major surfaces of the wall, as recited in claim 38.

Yoshiyuki, as presently understood, does not disclose tapered projections. Although Yasuo teaches an embedding form 1 having tapered projections, Yasuo teaches away from Yoshiyuki because forming a pattern of pyramidal projections 2, as taught by Yasuo, runs directly counter to Yoshiyuki's requirement of forming a block having a natural looking surface texture. Accordingly, there is no teaching or suggestion to combine Yoshyuki and Yasuo to derive the combination of features recited in claim 38.

21. Dependent Claim 39

Claim 39 depends from claim 36 and therefore is allowable for all the reasons discussed above regarding claim 36. In addition, claim 39 further recites that each projection has one side surface that is greater than that of another side surface. Unlike claim 39, the projections 2 of Yasuo's embedding form 1 have surfaces that appear to have the same slope.

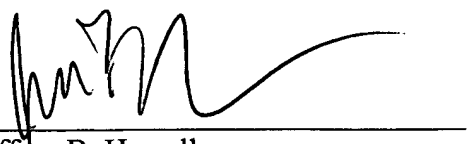
VIII. Conclusion

For at least the foregoing reasons, the final action failed to establish obviousness of claims 1-39 and 52. Accordingly, the rejections of these claims should be reversed and all claims passed to issue.

Respectfully submitted,

KLARQUIST SPARKMAN, LLP

One World Trade Center, Suite 1600
121 S.W. Salmon Street
Portland, Oregon 97204
Telephone: (503) 226-7391
Facsimile: (503) 228-9446

By 

Jeffrey B. Haendler
Registration No. 43,652

IX. Claims Appendix

1. An apparatus for molding a masonry block, comprising:

a mold comprising a plurality of walls defining at least one mold cavity adapted to receive block-forming material, the walls configured to retain block-forming material in the mold cavity, the mold defining an opening through which a formed, uncured block may be removed from the mold cavity; and

at least one said wall including a major surface having a plurality of tapered projections extending into the mold cavity so as to contact an adjacent surface of the uncured block in the mold cavity, whereby when the uncured block is removed from the mold cavity, the projections texture the adjacent surface of the uncured block.

2. The apparatus of claim 1, wherein the projections are generally frusto-pyramidal in shape.

3. The apparatus of claim 1, wherein the projections are generally pyramidal in shape.

4. The apparatus of claim 1, wherein the projections are provided substantially throughout said major surface.

5. The apparatus of claim 1, wherein at least one of said walls comprises a separating wall separating the mold into first and second mold cavities for forming first and second blocks, respectively, the separating wall having first and second major surfaces, at least the first major surface having a plurality of projections extending into the first mold cavity for texturing a surface of the first block.

6. The apparatus of claim 5, wherein the second major surface has a plurality of projections extending into the second mold cavity for texturing a surface of the second block.

7. The apparatus of claim 1, wherein at least two of said walls include major surfaces, each having a plurality of projections extending into the mold cavity for texturing at least two surfaces of the block as the block is removed from the mold.

8. The apparatus of claim 1, wherein the major surface defines top and bottom limits of the mold cavity and wherein at least some of the projections are provided on the major surface intermediate said top and bottom limits of the mold.

9. The apparatus of claim 1, wherein said at least one wall is generally vertical and wherein each projection has two generally upwardly facing side surfaces and two generally downwardly facing side surfaces.

10. The apparatus of claim 9, wherein the two generally upwardly facing side surfaces of each projection have slopes as measured from the vertical that are less than the slopes of the two generally downwardly facing side surfaces.

11. An apparatus for molding a masonry block, comprising:

a mold including an interior surface defining at least one mold cavity having opposite end limits and an end opening, the mold cavity being adapted to receive block-forming material to form an uncured block, and allow removal of such block from the mold cavity through the end opening, the interior surface being impervious to block-forming material; and

the interior surface including rows of projections between the opposite end limits for contacting the uncured block in the mold, the projections being positioned side-by-side in each row, each projection having a respective base that adjoins a base of an adjacent projection in the same row, such that when the uncured block is removed from the mold cavity, the projections create a roughened texture on the surface of the uncured block.

12. The apparatus of claim 11, wherein the mold comprises a plurality of walls defining the mold cavity.

13. The apparatus of claim 12, wherein the walls define multiple mold cavities.

14. The apparatus of claim 12 further comprising a mold insert coupled to a wall of the mold, and wherein the plurality of projections are provided on the mold insert and extend into the mold cavity.

15. The apparatus of claim 12, wherein the plurality of projections are provided on one of said walls.

16. The apparatus of claim 12, wherein the walls include a separating member dividing the mold cavity into multiple mold cavities, and wherein the plurality of projections are provided on the separating member and extend into at least one of the multiple mold cavities.

17. The apparatus of claim 11, wherein the projections are tapered.

18. The apparatus of claim 11, wherein the rows of projections extend diagonally across the interior surface of the mold so as to define diagonally extending grooves between adjacent rows of projections.

19. The apparatus of claim 11, wherein the projections are uniformly distributed on the interior surface.

20. An apparatus for molding masonry blocks, comprising:

a mold comprising first and second mold cavities and a separating member separating the first and second mold cavities and being generally impervious to block-forming material, the mold having a top and a bottom, the first and second mold cavities being adapted to receive block-forming material for forming first and second blocks, respectively, and the separating member having first and second major surfaces, the first major surface forming an interior surface of the first mold cavity and the second major surface forming an interior surface of the second mold cavity; and

a plurality of inwardly extending block-texturing members located along the first and second major surfaces of the separating member between the top and bottom of the mold, the block-texturing members being configured to produce a roughened texture on adjacent surfaces of the first and second blocks as they are removed from their respective mold cavities.

21. The apparatus of claim 20, wherein the block-texturing members are positioned side-by-side in rows of block-texturing members along the first and second major surfaces of the separating member.

22. The apparatus of claim 20, wherein the block-texturing members are generally frusto-pyramidal in shape.

23. The apparatus of claim 20, wherein the block-texturing members are generally pyramidal in shape.

24. The apparatus of claim 20, wherein the block-texturing members are positioned to scrape the adjacent surfaces of the first and second blocks as the blocks are removed from their respective mold cavities.

25. An apparatus for molding masonry blocks, comprising:

a mold comprising a plurality of walls forming first and second mold cavities and said walls including a separating member separating the first and second mold cavities, the first and second mold cavities being adapted to receive block-forming material for forming first and second blocks, respectively, and the separating member having first and second major surfaces, the first major surface forming an interior surface of the first mold cavity and the second major surface forming an interior surface of the second mold cavity;

a plurality of projections disposed on at least one of said walls of the mold and extending into the first mold cavity;

a plurality of projections disposed on at least one of said walls of the mold and extending into the second mold cavity; and

a plurality of projections disposed on at least one of said first and second major surfaces of the separating member and extending into the adjacent mold;

whereby when the first and second blocks are removed from the mold, the projections produce at least two roughened surfaces on one of said first and second blocks and at least one roughened surface on the other of said first and second blocks.

26. The apparatus of claim 25, wherein each projection has two generally upwardly facing side surfaces and two generally downwardly facing side surfaces.

27. The apparatus of claim 26, wherein the two generally upwardly facing side surfaces of each projection have slopes that are less than the slopes of the two generally downwardly facing side surfaces.

28. The apparatus of claim 25, wherein a plurality of projections are disposed on both the first and second major surfaces of the separating member.

29. A wall for use in a mold for molding a masonry block, comprising:

a body having first and second major surfaces, at least one of the first and second major surfaces having a plurality of projections extending outwardly therefrom, the projections tapering as they extend away from the body and arranged in rows of projections extending diagonally across the body so as to define grooves between adjacent rows extending diagonally across the body.

30. A wall for use in a mold for molding a masonry block, comprising:

a body having first and second major surfaces, at least one of the first and second major surfaces having a plurality of projections extending outwardly therefrom, the projections tapering as they extend away from the body;

wherein the projections are frusto-pyramidal in shape.

31. The wall of claim 29, wherein the projections are pyramidal in shape.

32. The wall of claim 29, wherein both the first and second major surfaces has a plurality of projections extending therefrom.

33. The wall of claim 29, wherein each projection has a first side surface and a second side surface, the first side surface having a slope that is greater than the slope of the second side surface.

34. The wall of claim 29, wherein the body and the projections are of a unitary construction.

35. The wall of claim 29, wherein the projections are removable from the body.

36. A wall for use in a mold for molding a masonry block, comprising:
a body having first and second major surfaces; and
a plurality of projections extending outwardly from the first and second major surfaces.

37. The wall of claim 36, wherein the wall is incorporated into a mold, the wall separating the mold into first and second mold cavities.

38. The wall of claim 36, wherein the projections are tapered.

39. The wall of claim 36, wherein each projection has one side surface with a slope that is greater than that of another side surface.

52. The wall of claim 29, wherein the plurality of the projections include projections that include a four-sided base, wherein each side adjoins a side of a base of another of said projections having a four-sided base.

X. Evidence Appendix

Attached are copies of the application as filed on March 4, 2002, the final Office action entered into the record by the Examiner on August 11, 2004, and the Advisory Action entered into the record by the Examiner on December 1, 2004.

Also attached are copies of the following references relied upon by the Examiner as to the grounds of rejection to be reviewed on appeal:

> Japanese Patent Publication No. 2001-191314 ("Yoshiyuki") and a computer-generated translation thereof; and
> Japanese Patent Publication No. 07-052133 ("Yasuo") and a computer-generated translation thereof.

Yoshiyuki and Yasuo were entered into the record by the Examiner in the Notice of References Cited sent with the Office action mailed on February 25, 2004.

APPARATUS AND METHODS FOR MAKING A MASONRY BLOCK WITH A ROUGHENED SURFACE

FIELD

This invention relates to an apparatus and method for making a masonry block, such as a retaining block, in which one or more surfaces have a roughened texture resembling that of a split block or natural stone.

BACKGROUND

Masonry products, such as blocks or bricks for constructing walls, have been made for many years by molding processes. A typical molding process involves the use of what is commonly known as a static block-making machine. Pallets made from metal or wood are fed by a conveyor into the block-making machine, which generally comprises a mold, a stripping device, a vibration mechanism, and a device for filling the mold with a cementitious mix. After the pallet has been located, the mold is lowered onto the pallet to form a mold cavity defined by the upper surface of the pallet and the inside surfaces of the side walls of the mold. A cementitious mix is then introduced into the mold cavity through the open top of the mold while simultaneously vibrating the mold and/or pallet. A compression or compacting head is lowered onto the cementitious material in the mold to facilitate densification of the cementitious material. The molded cementitious material is then stripped from the mold by raising the mold while the compacting head remains stationary relative to the mold, thereby pushing the molded block through the open bottom of the mold.

It is common to split off a portion of the cured block, such as with a splitting machine or a hammer and chisel, so as to create a decorative face on a surface of the block that resembles the surface texture of natural stone. The face created by the splitting process is often referred to in the industry as "split face" or "rock face." The splitting of cured blocks, however, involves additional equipment and manufacturing steps and results in material wastage. In order to avoid the shortcomings of conventional splitting processes, there have been efforts to achieve the same "split face" texture without additional splitting steps.

There are a number of patents, which disclose methods and apparatuses for producing a roughened surface on an uncured block during the molding process. For example, U.S. Patent No. 3,981,953 to Haines is understood to disclose a method of forming a roughened block face in which cementitious material is placed in a mold cavity, with a grid-like series of elements being disposed in the cavity and suspended from a top plate. After the block material is compacted into the cavity, the

side walls and top plate are drawn off the molded but uncured block. Upward movement of the top plate lifts the grid-like series of elements, and the block material between the elements and the lower plate is broken off from the lower block material in the mold, forming a roughened texture on the top face of the block. A drawback to this arrangement is that the pattern of the elements is cast in the top face of the block.

U.S. Patent No. 3,940,229 to Hutton is understood to disclose a mold in which a small lip is formed on the inner, lower edge of a vertical wall of the mold. As the densified, composite material is stripped from the mold, the lip moves vertically up an adjacent side wall of the block, and tears some of the composite material away from the surface of the block. The lip temporarily retains this composite material in place against a portion of the mold wall as the mold is stripped. The retained material is thus dragged, or rolled, up the surface of the adjacent side wall of the block as the mold is stripped, creating a roughened texture on the side wall of the block.

The process of the '229 patent tends to produce a textured face having horizontal striations so as to provide what may be referred to as a "shingled" appearance. In addition, the textured face is slightly tapered or sloped, as a result of the lip retaining fill material as the mold is stripped from the block.

Another example of an alternative to splitting is shown in U.S. Patent Nos. 5,078,940 and 5,217,630 to Sayles. These patents are understood to disclose a mold having a lower lip on a vertical wall of the mold, similar to that shown in the '229 patent. In addition, the mold employs a plurality of projections on the vertical wall above the lip, and a vertically oriented reinforcing mesh above the lip and spaced from the projections. When the mold is initially filled, the cementitious material fills in between the mesh and the wall, and around the projections. The combination of the lip, mesh and projections holds a large mass of compacted material against the mold as the mold is moved vertically upward to strip the uncured block from the mold. These patents appear to show the retained mass of material shearing from the rest of the material, and thus creating a roughened face on the molded block.

In the process of the '940 and '630 patents, the use of the projections holds a much larger mass of material against the mold side wall than is the case in the '229 process, and does this in a fashion so as to retain that material in the mold from cycle to cycle. Consequently, frequent stoppages in production may be required to clean the mold of material accumulated between the projections. Further, cleaning of the mold may be complicated by the presence of the screen.

Yet another apparatus for producing a block with a roughened surface is shown in U.S. Patent Nos. 5,879,603 and 6,138,983 to Sievert. The '603 and '983 patents are understood to disclose a mold having generally parallel upper and lower lips on a vertical wall of the mold. As the mold is moved vertically to strip the uncured block from the mold, fill material is retained in the space between the upper and lower lips. Like the process of the '940 and the '630 patents, the retained material is sheared from the uncured block, thereby creating a roughened surface.

U.S. Patent No. 6,209,848 to Bolles discloses an apparatus that is similar to the apparatus of the '603 and '983 patents. The '848 patent discloses a mold in which a lip is formed along the bottom edge of at least one wall of the mold, wherein a series of grooves are formed along the length of the lip.

Finally, U.S. Patent Nos. 6,113,379 and 6,224,815 to LaCroix are understood to disclose a mold having two mold cavities separated by a metal grate. The grate has openings to permit fill material to flow through the openings and form a single molded article in the mold. When the molded article is discharged from the mold, the article is separated into two masonry units by the grate, with each masonry unit having a roughened surface where the units were previously joined.

Despite the foregoing processes, there exists a continuing need for new and improved methods and apparatus for producing a masonry block that does not involve splitting but which creates a textured surface that resembles the "split face" look that can be achieved with a conventional splitting process.

SUMMARY

According to one aspect of the invention, an apparatus for making a masonry block with at least one roughened surface is provided. In one representative embodiment, a mold comprises a plurality of walls defining at least one mold cavity adapted to receive block-forming material. The mold defines an opening through which a formed, uncured block may be removed from the mold. At least one wall of the mold has a plurality of projections extending into the mold cavity so as to contact an adjacent surface of the uncured block in the mold cavity. The projections are positioned such that when the uncured block is removed from the mold, the projections texture the adjacent surface of the uncured block.

Desirably, the projections taper as they extend away from the wall of the mold. In a disclosed embodiment, the projections are generally frusto-pyramidal in shape and desirably are oriented on the wall with two side surfaces facing in a generally upward direction and two other side surfaces facing

in a generally downward direction. Desirably, although not necessarily, the two generally upwardly facing side surfaces of each projection have a slope that is less than the slope of the two generally downwardly facing side surfaces. In addition, at least some of the projections are located between the top and bottom of the mold. In one example, the projections may be positioned in plural rows of projections along the wall of the mold, with the projections being in contacting relationship with other at their bases so as to minimize spacing between adjacent projections.

In addition, the mold may have a separating wall for separating the mold into first and second mold cavities, each of which is adapted to receive block-forming material for forming first and second blocks, respectively. A first major surface of the separating wall may have a plurality of projections extending into the first mold cavity for texturing a surface of the first block. A second major surface of the separating wall may have a plurality of projections extending into the second mold cavity for texturing a surface of the second block.

According to yet another representative embodiment, an apparatus for molding masonry blocks comprises a mold. A plurality of mold walls define an interior space of the mold. A separating member separates the interior space into first and second mold cavities, each being adapted to receive block-forming material for forming first and second blocks, respectively. The separating member has first and second major surfaces, with the first major surface forming an interior surface of the first mold cavity and the second major surface forming an interior surface of the second mold cavity. A plurality of projections are disposed on one of said mold walls and extend into the first mold cavity. A plurality of projections are also disposed on another of the mold walls and extend into the second mold cavity. In addition, the first and second major surfaces of the separating member have a plurality of projections extending into the first and second mold cavities, respectively. The projections are positioned such that when the first and second blocks are removed from the mold, the projections produce a roughened texture on at least two surfaces of the first and second blocks.

According to another aspect of the invention, a wall for use in a mold for making a masonry block with a roughened surface is provided. The wall, in one configuration, comprises a body having first and second major surfaces. At least one of the first and second major surfaces has a plurality of block-texturing members extending outwardly from the body. Desirably, the block-texturing members taper as they extending away from the body. In another configuration, both the first and second major surfaces have a plurality of block-texturing members. In either case, the body and the block-texturing members may be of a unitary construction, or alternatively, the block-texturing members may be configured to be removable from the body.

The block-texturing members in an illustrated embodiment are generally frusto-pyramidal in shape. Desirably, although not necessarily, the block-texturing members may have a side surface that has a slope greater than that of another side surface. In addition, the block-texturing members may be positioned side-by-side in contacting relationship with each other along one or both of the first and second major surfaces.

According to another aspect of the invention, a method for making a masonry block having at least one roughened surface is provided. In one specific approach, block-forming material is introduced into a mold cavity having plural inwardly extending projections located between the top and bottom of the mold cavity. An uncured block is formed in the mold cavity, after which the mold cavity is moved relative to the uncured block. The relative movement of the mold cavity causes the projections to produce a roughened texture on a surface of the uncured block. Typically, moving the mold cavity for producing the roughened texture on the block comprises moving the mold cavity (e.g., raising the mold cavity) until the uncured block is removed, or stripped, from the mold cavity. The projections desirably are configured to avoid retaining block-forming material in the spaces between adjacent projections as the uncured block is removed from the mold.

These and other features of the invention will be more fully appreciated when the following detailed description of the invention is read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front elevational view of a mold wall according one embodiment for use in a mold for forming a masonry block, showing a plurality of frusto-pyramidal shaped projections extending outwardly from one major surface of the wall.

FIG. 2 is a cross-sectional view of the mold wall of FIG. 1 taken along line 2-2 of FIG. 1.

FIG. 3 is a cross-sectional view of the mold wall of FIG. 1 taken along line 3-3 of FIG. 1.

FIG. 4 is a cross-sectional view of an apparatus, including a mold filled with cementitious material, according to one embodiment for molding a masonry block, in which the forward and rear walls of a mold have the same general configuration as the mold wall shown in FIG. 1.

FIG. 5 is a cross-sectional view of the apparatus of FIG. 4 showing a formed, uncured block being removed from the mold.

FIG. 6 is a horizontal cross-sectional view of the mold of FIG. 4 taken along line 6-6 of FIG. 4.

FIG. 7 is a cross-sectional view of an apparatus, including a mold filled with cementitious material, according to another embodiment for molding two masonry blocks, in which a divider plate or wall separates the mold into first and second mold cavities for forming first and second blocks, respectively.

DETAILED DESCRIPTION

According to one aspect, the invention provides an apparatus and method for making masonry units or blocks having one or more roughened surfaces without using conventional splitting techniques. The invention can be adapted for use with different types of molds to produce various types of blocks, such as decorative architectural blocks, paving stones, landscaping blocks, retaining wall blocks and the like.

Referring first to FIGS. 4-6, there is shown a schematic illustration of a block-forming apparatus 60, according to one embodiment, for forming a masonry unit or block having at least one roughened surface. The apparatus 60 in the illustrated configuration comprises a generally rectangular-shaped mold 62 supported on a suitable support surface, such as a pallet 70. As shown, the mold 62 comprises vertically upright opposed forward and rear walls 10, 10', respectively, and opposed side walls 64, 66, extending between respective ends of the forward and rear walls 10, 10' (FIG. 6). The walls 10, 10', 64 and 66 collectively define a mold cavity 68 adapted to receive fill material (also referred to herein as block-forming material) for forming a block 72. The walls 10, 10', 64 and 66 are desirably generally impervious to block-forming material so that block-forming material is retained in the mold cavity 68 by the walls. The mold 62 has an open top through which fill material may be introduced into the mold cavity 68 and an open bottom through which the formed, uncured block 72 may be removed, or stripped, from the mold cavity 68.

A substantially horizontal pusher plate 74 may be provided to facilitate compression of the fill material during the block forming process and removal of the formed, uncured block 72 from the mold cavity 68. The pusher plate 74, which is shaped so as to be able to fit slidably within the mold cavity 68, is operable for movement between a raised position above the mold 62 (FIG. 4) and a lowered position within the mold cavity 68 for compressing the fill material and for removing the formed, uncured block from the mold cavity 68 (FIG. 5). The pusher plate 74 may be coupled to any suitable mechanism for moving the pusher plate 74 between the raised and lowered positions and for pressing the pusher plate 74 against the top surface of the block 72. For example, the pusher plate 74 may be coupled to a hydraulic ram, as generally known in the art.

The shape of the mold cavity 68 defines the plan shape and size of the block 72 (i.e., the shape and size of the block when viewed from above or below), with each wall 10, 10', 64 and 66 forming an adjacent vertical surface of the block 72. The bottom and top surface of the block 72 are formed by the upper surface of the pallet 70 and the lower surface of the pusher plate 74, respectively. The walls 10, 10', which, in the illustrated embodiment, are identical in construction, have interior surfaces configured to texture adjacent surfaces of the block 72 as it is removed from the mold cavity 68, as explained in greater detail below. The mold cavity 68 in the configuration shown in FIGS. 4-6 has a generally rectangular plan shape to provide a block having the same shape. However, the shape of the mold cavity 68 can be varied to provide blocks having other geometrical plan shapes. For example, one or more of the walls defining the mold cavity 68 can be configured to intersect an adjacent wall at an angle that is greater than or less than 90°. In addition, one or more of the walls of the mold cavity 68 may be curved or rounded. Alternatively, a wall may comprise plural segments interconnected to each other at angles. Moreover, the mold cavity 68 may have greater than or less than four vertical walls.

Although the mold 62 of FIGS. 4-6 is shown as having two walls for texturing opposed surfaces of the block 72 (walls 10, 10'), in other embodiments, only one such wall may be used, or alternatively, two adjacent such walls may be used, or more than two walls for texturing the surfaces of a block may be used.

FIGS. 1-3 illustrate in greater detail the wall 10 of the mold 62 shown in FIGS. 4-6. As mentioned, the wall 10' is identical in construction to wall 10. Thus, the following description, which proceeds in reference to the wall 10, is also applicable to the wall 10'. The wall 10 in the illustrated configuration comprises a body 12 having first major surface 14, which serves as an interior surface of the mold cavity 68, and second major surface 16. A plurality of abutting block-texturing members, or projections, 18 extend outwardly from the first surface 14. As shown in FIGS. 4 and 5, the projections 18 on the walls 10, 10' project into the mold cavity 68 and contact an adjacent surface of the block 72. As the mold 62 is moved vertically with respect to the block 72 for removing the block 72 from the mold cavity 68, as indicated by arrow A in FIG. 5, the projections 18 produce a "scraping," or "tearing," action on the respective adjacent surfaces of the block 72, thereby creating an irregularly roughened surface for those sides of the block 72.

As shown in FIGS. 1-3, the projections 18 desirably taper as they extend outwardly from the first surface 14. In the illustrated embodiment, for example, each projection 18 is generally "frusto-pyramidal" in shape, that is, each projection 18 has a square-shaped base 28 at the first surface 14, a

flattened, square-shaped end surface or crest 30 spaced from the base 28, and four flat side surfaces 20, 22, 24 and 26 that converge as they extend from the base 28 to the end surface 30. However, it is contemplated that other tapered or non-tapered shapes may be used for the projections 18. For example, the projections 18 may be pyramidal, conical, frusto-conical, rectangular, square, cylindrical, or any of other various shapes.

Desirably, the projections 18 are distributed uniformly throughout the surface area of the first major surface 14. As best shown in FIG. 1, the projections 18 desirably are arranged side-by-side in diagonal rows extending across the first surface 14 without spacing between projections or between adjacent rows of projections. Although less desirable, in other embodiments, the rows of projections 18 may extend horizontally across the first surface so as to form a "checkerboard" pattern of projections. In addition, in other embodiments, the projections 18 may be spaced apart in the direction of the rows of projections. In still other embodiments, the rows of projections may be spaced from each other.

As shown in FIG. 1 and except for those projections bordering the edges of the wall 10, the base 28 of each projection 18 adjoins the base 28 of an adjacent projection to minimize spacing between the crests 30 of adjacent projections. The side surfaces 20, 22 of each projection 18 face in a generally upward direction and the side surfaces 24, 26 of each projection 18 face in a generally downward direction. Thus, it can be seen that the side surfaces 20, 22, along with the end surface or crest 30, of each projection 18 produce the scraping action against the adjacent surface of the block 72 as the wall 10 is moved vertically with respect to the block 72 in the direction of arrow A.

In the illustrated embodiment, the side surfaces 20, 22 of the projections 18 have slopes that are less than the slopes of the side surfaces 24, 26. It is believed that this minimizes the likelihood of fill material being retained in the spaces between adjacent projections as the block 72 is being removed from the mold cavity 68.

In the embodiment of FIGS. 1-3, the wall 10 and the projections 18 are of a unitary, monolithic construction. The wall 10 may be formed by machining the projections 18 into one surface of apiece material used to form the mold wall. In one specific implementation, the projections 18 are machined in a 1/2 inch thick piece of material (e.g., steel) to a depth of about 1/4 inch. The width of each projection is about .87 inch at their respective bases 28 and about .19 inch at their respective end surfaces 30.

In other embodiments, the projections may be separately formed and then coupled or otherwise mounted to the mold wall, such as by welding or with conventional releasable fasteners

(e.g., bolts). If releasable fasteners are used, projections that are worn-out can be removed and replaced with new projections.

In still other embodiments, the walls 10, 10' can be used as "inserts" for an existing mold. When used in this manner, the walls 10, 10' are coupled to the interior surfaces of existing walls of a mold.

Explaining the operation of the apparatus 60, according to one specific approach, and referring initially to FIG. 4, the mold 62 and the pallet 70 can be moved into place under the pusher plate 74, such as by way of a conveyor (not shown). The mold 62 is then loaded with a flowable, composite cementitious fill material through the open top of the mold. Composite fill material generally comprises, for example, aggregate material (e.g., gravel or stone chippings), sand, mortar, cement, and water, as generally known in the art. The fill material also may comprise other ingredients, such as pigments, plasticizers, and other fill materials, depending upon the particular application.

The mold 62, or the pallet 70, or a combination of both may be vibrated for suitable period of time to assist in the loading of the mold 62 with fill material. The pusher plate 74 is then lowered into the mold cavity 68, against the top of the mass of fill material. The pusher plate 74 desirably is sized so as to provide a slight clearance with the projections 18 of the walls 10, 10' when lowered into the mold cavity 68. Additional vibration, together with the pressure exerted by the pusher plate 74 acts to densify the fill material and form the final shape of the block 72.

After the block 72 is formed, the formed, uncured block 72 is removed from the mold such as by raising the mold 62 (as indicated by arrow A in FIG. 5), while maintaining the vertical position of the pusher plate 74 and the pallet 70 so that the block 72 is pushed through the open bottom of the mold 62. Alternatively, the block 72 can be pushed through the mold 62 by moving the pusher plate 74 through the mold 62, while simultaneously lowering the pallet and maintaining the vertical position of the mold 62. In either case, the action of stripping the block 72 from the mold 62 creates a roughened texture of the walls of the block that contact the projections 18 on walls 10, 10'. Since the mold is not configured to retain fill material for the purpose of creating the roughened surfaces of the block, unlike some prior art devices, the mold 62 does not require frequent stoppages in production to clear material from the walls of the mold.

Because the projections 18 do not retain fill material as the block 72 is stripped from the mold 62, the block 72 maintains its dimensional tolerances. Thus, the roughened surfaces of the block 72 will be substantially perpendicular to the top and bottom of the block 72 and the block 72 will have a substantially constant cross-sectional profile from top to bottom.

The mold filling time, the vibration times and the amount of pressure exerted by the pusher plate 74 are determined by the particular block-forming machine being used, and the particular application. After the block is removed from the mold 62, it may be transported to a suitable curing station, where it can be cured using any suitable curing technique, such as, air curing, autoclaving, steam curing, or mist curing.

The mold 62 may be adapted for use with any conventional block-forming machine.

Referring to FIG. 7, there is shown an apparatus 100 for forming two masonry blocks. In this embodiment, the apparatus 100 comprises a mold 102 supported on a suitable support surface, such as a pallet 104. The mold 102 comprises vertically upright opposed forward and rear walls 10, 10', respectively, and opposed side walls (not shown), extending between respective ends of the forward and rear walls 10, 10'. The walls of the mold 102 define a first mold cavity 106 and a second mold cavity 108, separated by a vertically upright separating wall 110 (also referred to herein as a separating member), which extends between the side walls of the mold 102. The first and second mold cavities 106, 108 are adapted to receive fill material for forming first and second blocks 116, 118, respectively. A first pusher plate 112 and a second pusher plate 114 may be provided to facilitate compression of the fill material in the first and second mold cavities 106, 108, respectively, and removal of the blocks from their respective mold cavities. Other configurations for mold 102 also may be used. For example, the first and second mold cavities 106, 108, respectively may have different shapes so that blocks of different shapes can be made.

The separating wall 110 has a first major surface 120 and a second major surface 122. As shown, the first major surface 120 helps define and serves as an interior surface of the first mold cavity 106 while the second major surface 122 helps define and serves as an interior surface of the second mold cavity 108. The wall 10 has a plurality of projections 18 extending into the first mold cavity 106 for texturing an adjacent surface of the first block 116. Similarly, the wall 10' has a plurality of projections 18 extending into the second mold cavity 108 for texturing an adjacent surface of the second block 118. In addition, both the first and second major surfaces 120, 122 of the separating wall 110 have a plurality of projections 18 extending into their associated mold cavities 106, 108, respectively, for texturing respective adjacent surfaces of blocks 116, 118. Thus, the apparatus 100 of FIG. 7 can be used to produce two blocks, each having at least two opposed roughened surfaces.

In other embodiments, either the wall 10, the wall 10', or both of the walls 10, 10' can be conventional mold walls (i.e., walls without projections 18), in which case one or both blocks would

have only a single roughened surface formed by the separating wall 110. Still alternatively, more than two walls of one or both mold cavities 106, 108 can be provided with projections 18 to produce roughened surfaces on more than two surfaces of a block. Also, only one surface 120 or 122 of the separating wall 110 may be provided with projections 18, in which case one of the two blocks produced would have a different number of roughened walls than the other.

The walls 10, 10' (FIGS. 4-7), as well as wall 110 (FIG. 7), are "self-cleaning" in that they are configured to avoid retaining block-forming material as the uncured block(s) are removed from the molds. Consequently, increased production throughout can be achieved because the mold walls do not have to be cleaned between each cycle. In addition, as noted above, because the projections do not retain block-forming material, the resulting blocks maintain their dimensional tolerances.

The invention has been described with respect to particular embodiments and modes of action for illustrative purposes only. The present invention may be subject to many modifications and changes without departing from the spirit or essential characteristics thereof. We therefore claim as our invention all such modifications as come within the scope of the following claims.

WE CLAIM:

1. An apparatus for molding a masonry block, comprising:

a mold comprising a plurality of walls defining at least one mold cavity adapted to receive block-forming material, the walls configured to retain block-forming material in the mold cavity, the mold defining an opening through which a formed, uncured block may be removed from the mold cavity; and

at least one said wall including a major surface having a plurality of tapered projections extending into the mold cavity so as to contact an adjacent surface of the uncured block in the mold cavity, whereby when the uncured block is removed from the mold cavity, the projections texture the adjacent surface of the uncured block.

2. The apparatus of claim 1, wherein the projections are generally frusto-pyramidal in shape.

3. The apparatus of claim 1, wherein the projections are generally pyramidal in shape.

4. The apparatus of claim 1, wherein the projections are provided substantially throughout said major surface.

5. The apparatus of claim 1, wherein at least one of said walls comprises a separating wall separating the mold into first and second mold cavities for forming first and second blocks, respectively, the separating wall having first and second major surfaces, at least the first major surface having a plurality of projections extending into the first mold cavity for texturing a surface of the first block.

6. The apparatus of claim 5, wherein the second major surface has a plurality of projections extending into the second mold cavity for texturing a surface of the second block.

7. The apparatus of claim 1, wherein at least two of said walls include major surfaces, each having a plurality of projections extending into the mold cavity for texturing at least two surfaces of the block as the block is removed from the mold.

8. The apparatus of claim 1, wherein the major surface defines top and bottom limits of the mold cavity and wherein at least some of the projections are provided on the major surface intermediate said top and bottom limits of the mold.

9. The apparatus of claim 1, wherein said at least one wall is generally vertical and wherein each projection has two generally upwardly facing side surfaces and two generally downwardly facing side surfaces.

10. The apparatus of claim 9, wherein the two generally upwardly facing side surfaces of each projection have slopes as measured from the vertical that are less than the slopes of the two generally downwardly facing side surfaces.

11. An apparatus for molding a masonry block, comprising:

a mold including an interior surface defining at least one mold cavity having opposite end limits and an end opening, the mold cavity being adapted to receive block-forming material to form an uncured block, and allow removal of such block from the mold cavity through the end opening, the interior surface being impervious to block-forming material; and

the interior surface including rows of projections between the opposite end limits for contacting a block in the mold, the projections being positioned side-by-side in each row, whereby when the block is removed from the mold cavity, the projections create a roughened texture on the surface of the block.

12. The apparatus of claim 11, wherein the mold comprises a plurality of walls defining the mold cavity.

13. The apparatus of claim 12, wherein the walls define multiple mold cavities.

14. The apparatus of claim 12 further comprising a mold insert coupled to a wall of the mold, and wherein the plurality of projections are provided on the mold insert and extend into the mold cavity.

15. The apparatus of claim 12, wherein the plurality of projections are provided on one of said walls.

16. The apparatus of claim 12, wherein the walls include a separating member dividing the mold cavity into multiple mold cavities, and wherein the plurality of projections are provided on the separating member and extend into at least one of the multiple mold cavities.

17. The apparatus of claim 11, wherein the projections are tapered.

18. The apparatus of claim 11, wherein the rows of projections extend diagonally across the interior surface of the mold cavity.

19. The apparatus of claim 11, wherein the projections are uniformly distributed on the interior surface.

20. An apparatus for molding masonry blocks, comprising:

a mold comprising first and second mold cavities and a separating member separating the first and second mold cavities and being generally impervious to block-forming material, the mold having a top and a bottom, the first and second mold cavities being adapted to receive block-forming material for forming first and second blocks, respectively, and the separating member having first and second major surfaces, the first major surface forming an interior surface of the first mold cavity and the second major surface forming an interior surface of the second mold cavity; and

a plurality of inwardly extending block-texturing members located along the first and second major surfaces of the separating member between the top and bottom of the mold, the block-texturing members being configured to produce a roughened texture on adjacent surfaces of the first and second blocks as they are removed from their respective mold cavities.

21. The apparatus of claim 20, wherein the block-texturing members are positioned side-by-side in rows of block-texturing members along the first and second major surfaces of the separating member.

22. The apparatus of claim 20, wherein the block-texturing members are generally frusto-pyramidal in shape.

23. The apparatus of claim 20, wherein the block-texturing members are generally pyramidal in shape.

24. The apparatus of claim 20, wherein the block-texturing members are positioned to scrape the adjacent surfaces of the first and second blocks as the blocks are removed from their respective mold cavities.

25. An apparatus for molding masonry blocks, comprising:

a mold comprising a plurality of walls forming first and second mold cavities and said side walls including a separating member separating the first and second mold cavities, the first and second mold cavities being adapted to receive block-forming material for forming first and second blocks, respectively, and the separating member having first and second major surfaces, the first major surface forming an interior surface of the first mold cavity and the second major surface forming an interior surface of the second mold cavity;

a plurality of projections disposed on at least one of said walls of the mold and extending into the first mold cavity;

a plurality of projections disposed on at least one of said walls of the mold and extending into the second mold cavity; and

a plurality of projections disposed on at least one of said first and second major surfaces of the separating member and extending into the adjacent mold;

whereby when the first and second blocks are removed from the mold, the projections produce at least two roughened surfaces on one of said first and second blocks and at least one roughened surface on the other of said first and second blocks.

26. The apparatus of claim 25, wherein each projection has two generally upwardly facing side surfaces and two generally downwardly facing side surfaces.

27. The apparatus of claim 26, wherein the two generally upwardly facing side surfaces of each projection have slopes that are less than the slopes of the two generally downwardly facing side surfaces.

28. The apparatus of claim 25, wherein a plurality of projections are disposed on both the first and second major surfaces of the separating member.

29. A wall for use in a mold for molding a masonry block, comprising:

a body having first and second major surfaces, at least one of the first and second major surfaces having a plurality of projections extending outwardly therefrom, the projections tapering as they extend away from the body.

30. The wall of claim 29, wherein the projections are frusto-pyramidal in shape.

31. The wall of claim 29, wherein the projections are pyramidal in shape.

32. The wall of claim 29, wherein both the first and second major surfaces has a plurality of projections extending therefrom.

33. The wall of claim 29, wherein each projection has a first side surface and a second side surface, the first side surface having a slope that is greater than the slope of the second side surface.

34. The wall of claim 29, wherein the body and the projections are of a unitary construction.

35. The wall of claim 29, wherein the projections are removable from the body.

36. A wall for use in a mold for molding a masonry block, comprising:

a body having first and second major surfaces; and

a plurality of projections extending outwardly from the first and second major surfaces.

37. The wall of claim 36, wherein the wall is incorporated into a mold, the wall separating the mold into first and second mold cavities.

38. The wall of claim 36, wherein the projections are tapered.

39. The wall of claim 36, wherein each projection has one side surface with a slope that is greater than that of another side surface.

40. A method for making a masonry block having a roughened surface, the method comprising:

introducing block-forming material into a mold cavity, the mold cavity formed by mold walls all of which are configured to retain block-forming material in the mold cavity, at least one mold wall having plural, tapered projections extending into the mold cavity and located between the top and bottom of the mold cavity;

forming an uncured block in the mold cavity; and

moving the mold cavity relative to the uncured block so that the projections produce a roughened texture on a surface of the uncured block.

41. The method of claim 40, wherein moving the mold cavity relative to the uncured block comprises removing the uncured block through an opening in the mold.

42. The method of claim 41, wherein the projections are configured to avoid retaining block-forming material as the uncured block is removed from the mold.

43. The method of claim 40, wherein the projections are of uniform configuration and are dispersed uniformly throughout the area of the wall.

44. A masonry block having at least one roughened surface, the roughened surface being formed by a method comprising:

introducing block-forming material into a mold cavity to form an uncured block, the mold cavity formed from a plurality of mold walls configured to retain block-forming material in the mold

cavity, at least one of said mold walls having plural inwardly extending, tapered projections located between the top and bottom of said wall; and

moving the mold relative to the uncured block so that the projections produce a roughened surface on the block.

45. The block of claim 44, wherein the act of moving the mold relative to the uncured block comprises removing the uncured block through an opening in the mold cavity.

46. The block of claim 44, wherein a plurality of the mold walls have plural inwardly extending projections located between the top and bottom of the mold cavity so that a plurality of roughened surfaces are formed on the block.

47. The block of claim 44, wherein the projections contact an adjacent side surface of the uncured block in the mold cavity.

48. A masonry block having at least one roughened surface, the roughened surface being formed by a method comprising:

introducing block-forming material into a mold to form an uncured block, the mold comprising a plurality of mold walls being generally impervious to block-forming material, at least one of said mold walls having plural projections extending into the mold cavity so as to contact an adjacent side surface of the uncured block in the mold cavity, the projections having respective bases at said mold wall, at least some of the projections being positioned with their respective bases in contacting relationship with each other; and

stripping the uncured block from the mold cavity so that the projections create a roughened surface on the block.

49. The block of claim 48, wherein the method further comprises densifying the block-forming material in the mold cavity prior to stripping the uncured block from the mold cavity.

50. The block of claim 48, wherein the projections are tapered.

51. A method of providing a roughened surface on a retaining wall block comprising:

providing a mold having walls defining a mold cavity and opposite end openings;

providing at least one of the walls with tapered projections extending into the cavity and distributed throughout at least a major surface area of the at least one wall;

filling the mold cavity with block-forming material to form an uncured block in the cavity; and

stripping the uncured block from the mold by moving the block relative to the walls through one of the opposite end openings.

APPARATUS AND METHODS FOR MAKING A MASONRY BLOCK WITH A ROUGHENED SURFACE

ABSTRACT

Apparatus and methods are disclosed for making masonry blocks with one or more surfaces having a roughened texture resembling that of a split block or natural stone. In one embodiment, a mold comprises a plurality of walls defining at least one mold cavity adapted to receive block-forming material. The mold defines an opening through which a formed, uncured block may be removed from the mold. At least one wall of the mold has a plurality of projections extending into the mold cavity so as to contact an adjacent surface of the uncured block in the mold cavity. The projections are positioned such that when the uncured block is removed from the mold, the projections texture the adjacent surface of the uncured block.

FIG. 3

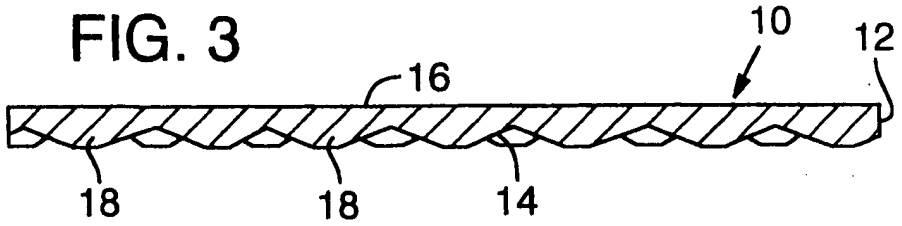
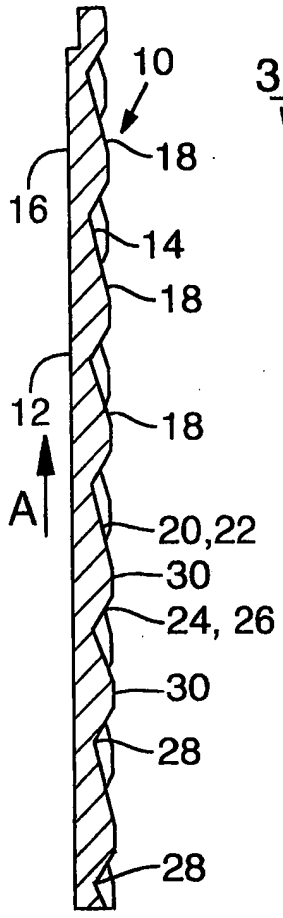


FIG. 2



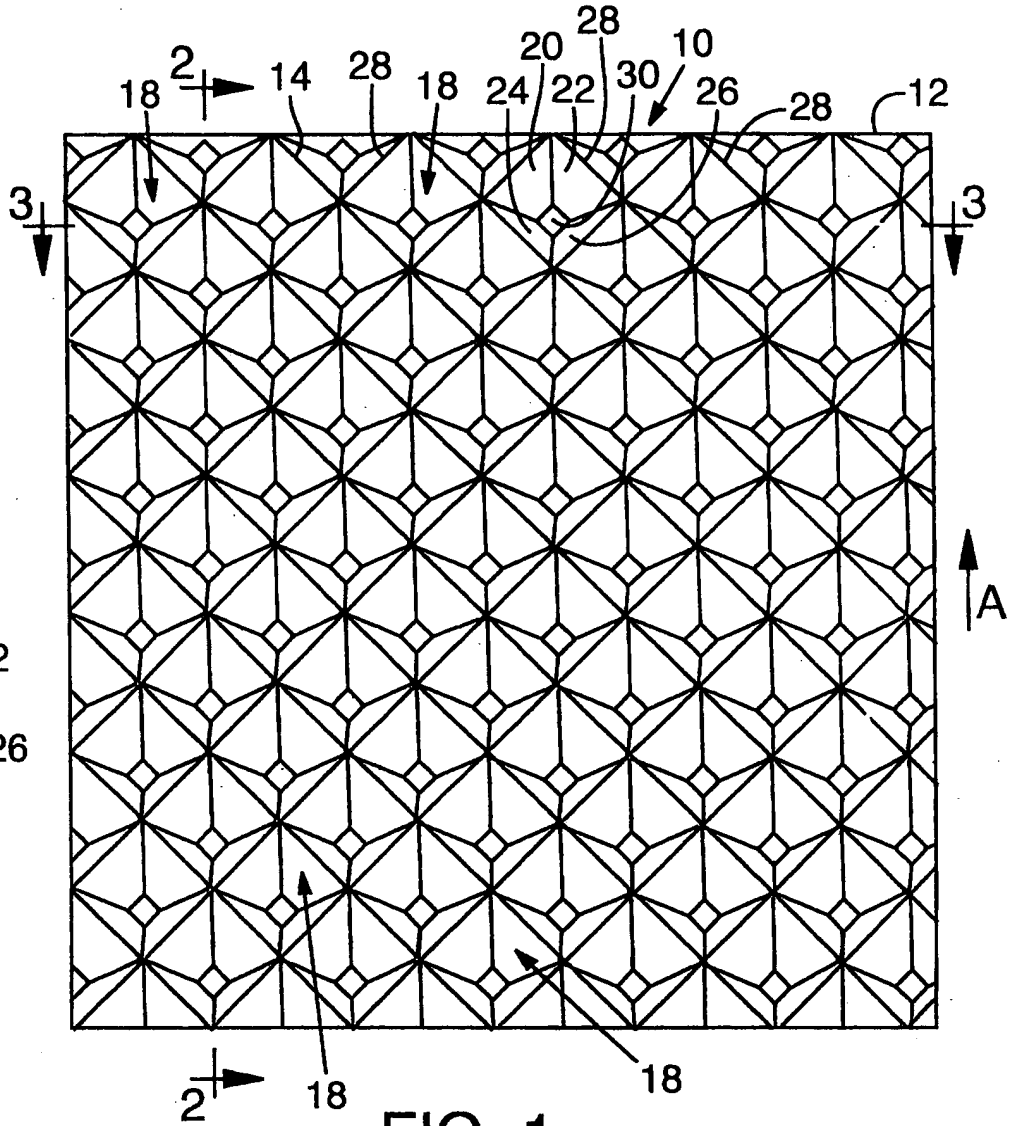


FIG. 1

FIG. 4

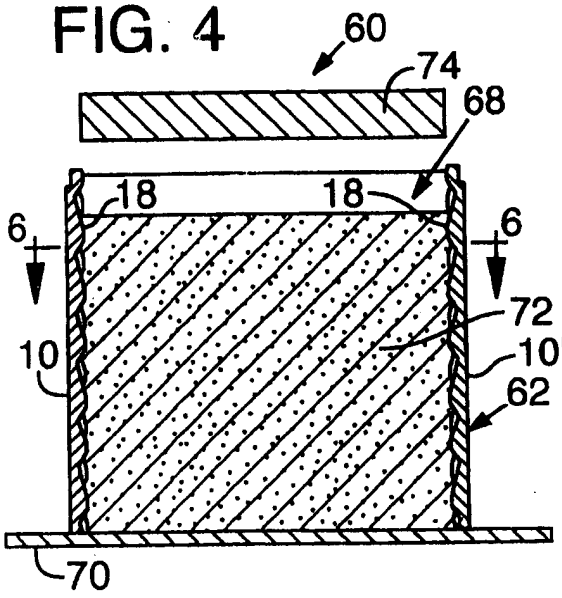


FIG. 5

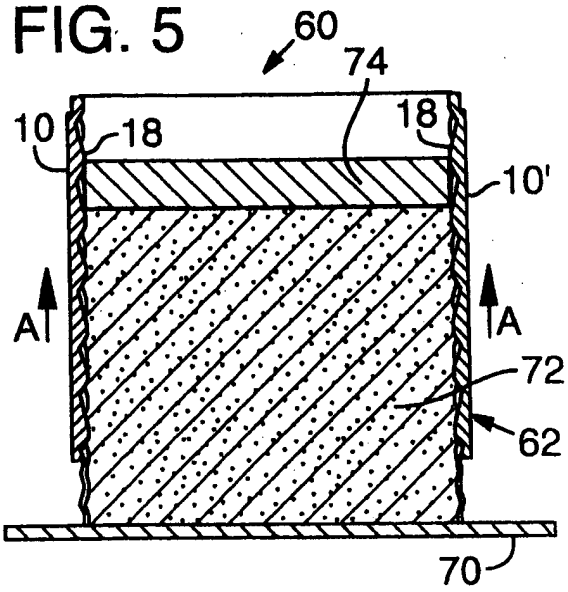


FIG. 6

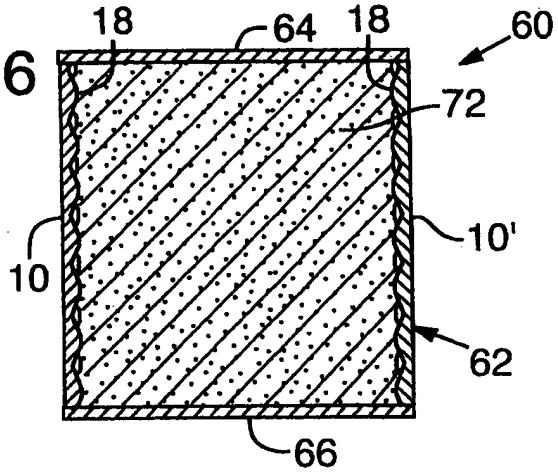
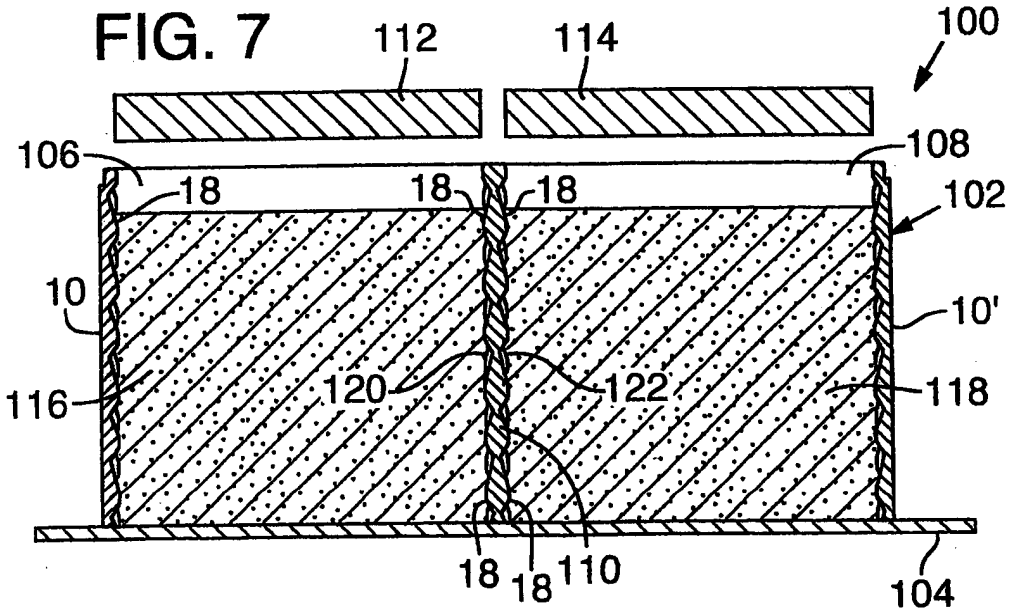


FIG. 7



UNITED STATES PATENT AND TRADEMARK OFFI

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/091,039	03/04/2002	James Hammer	1342-61338	6479

7590 08/11/2004

One World Trade Center
Suite 1600
121 S.W. Salmon Street
Portland, OR 97204

EXAMINER	
NGUYEN, THUKHANH T	

ART UNIT	PAPER NUMBER
1722	

DATE MAILED: 08/11/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/091,039	HAMMER ET AL.	
	Examiner	Art Unit	
	Thu Khanh T. Nguyen	1722	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 May 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-53* is/are pending in the application.

4a) Of the above claim(s) *40-51 and 53* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-39 and 52* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of group I, claims 1-39 in the reply filed on May 25, 2004 is acknowledged. The traversal is on the ground(s) that the method and the product could not be made by another and materially different apparatus. This is not found persuasive because the method and product as claimed could be made by an apparatus having a vibrator, an upper ram and a lower ram, or a ram and a press plate. Furthermore, the method and product concern about an uncured block, while the apparatus as claimed could be used to emboss the surface of cured adobe blocks, semi-cured adobe blocks, or embossing blocks with different material such as ice blocks or cheese blocks. Claims 40-51 and 53 are withdrawn from further consideration as they are non-elected claims.

The requirement is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-39 and 52 are again rejected under 35 U.S.C. 103(a) as being unpatentable over the JP 2001-191314 (JP'314) in view of the JP 07-052133 (JP'133).

The JP'314 reference disclose a molding apparatus for forming concrete blocks, comprising mold walls (210) and a plurality of partition walls (230) defining a plurality of mold cavities and openings for removing the blocks from the cavities (Fig. 5a-b), wherein the walls

including a plurality of projections (231, 232) for forming a uniform pattern throughout most of the surface (720) of the concrete blocks; and a plurality of mold inserts (240) extended into the mold cavities.

The JP'314 fails to disclose that the projections are tapered or having pyramidal shape and the projections are removable from the mold wall.

The JP'133 discloses a casting mold for precasting concrete material, comprising a mold surface (1) having a plurality of tapered projections (2) to form cone-like projections (§ 0001) all over the main surface of the concrete blocks (§ 0009); the projection can also be a triangle pyramid, a rectangular pyramid, or a hexagon pyramid (§ 0010) and has a slant face with a curved surface of 40-50 degrees to emboss the forming block and to increase the contact surface between the mold and the concrete block to improve the integrity and the shear strength of the concrete (§ 0008 & § 0012). The casting mold (3) also includes a separate layer (4) having a plurality of projections (2) on the surface.

It would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the JP'314 by providing a plurality of pyramidal shape projections on the mold surface and the projections are removable from the mold wall as taught by the JP'133, because the slant surface of the pyramidal shape projections would increase the contacting surface between the mold and the concrete material to improve the integrity of the forming concrete blocks; wherein the removable projections on the mold wall would enable the mold to form concrete blocks having different surface patterns.

In regard to the orientation of the projections on the mold surface, it would have been obvious to one of ordinary skill in the art to rearrange the projections on the mold surface to form

a desired embossing pattern on the block surfaces. It has been held that by merely shifting the position of the parts without changing the operation of the mechanism will not render the claims patentable and the placement of the mechanism is an obvious matter of design choice. In re Japikse, 181 F.2d 1019, 86 USPQ 70 (CCPA 1950); In re Kuhle, 526 F.2d 553, 188 USPQ 7 (CCPA 1975).

In regard to the slope of the side surface of the projections, it would have been obvious to one of ordinary skill in the art to change the slope of the side surfaces depending on the desired shape of the projections. The JP'133 has recognized that a slant face redistributes the compression force and increase the shear strength (§ 0012-0014); thus, it would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the JP'314 by providing a larger slant surface in the compression direction to reduce stress concentration on the surface of the concrete blocks.

Response to Arguments

4. Applicant's arguments filed May 25, 2004 have been fully considered but they are not persuasive.

5. In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392,

170 USPQ 209 (CCPA 1971). Further, both Yoshiyuki and Yasuo are related to surface embossing of concrete blocks. One who looks into one reference would more than likely to look at the other reference since they both are in the same technology field.

In response to applicant's argument that the shape of the projections would affect the final surface texture of the block. However, this again is the matter of design choice because the projections shapes are changed in according with the desired final surface texture of the block, and the structure of the wall or the function of the projections does not changed from the prior art. There is no invention in merely changing the shape or form of an article without changing its function except in a design patent. See Eskimo Pie Corp. v. Levous et al., 3 USPQ 23 and In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966)

With respect to claims 9 and 10, the applicant alleged that none of the prior art teaches two generally upwardly facing side surface and two generally downward facing side surface. Yasuo, however, discloses that each of the projection is a regular quadrangular pyramid, which includes four slant surfaces, and each of these surfaces could be understood as an upward or downward facing surface, depending on the reference point. The angle and the size of each slant surface could be changed in according with the desired shape and size of the projection on the surface of the forming block.

In regard to claims 11-19, the applicant asserted that none of the references discloses an interior surface includes rows of projections positioned side-by-side in each row, with each projection having a respective base that adjoins a base of an adjacent projection in the same row. This structure is clearly shown in Figures 1a, 2a-b of the Yasuo reference, each of the projection

is a pyramid having a base adjoin with the base of the next projection. All projections are aligned in adjacent rows and columns.

In regard to claims 20-28, the Applicant have recited the limitations of the claims, but fails to indicate how the claims would not be obvious in view of the prior art. Therefore, the rejections are still deem proper.

In regard to the orientation of the projections, it would have been obvious to one of ordinary skill in the art to rearrange the projections on the mold surface in order to form a product having different projections design. It has been held that by merely shifting the position of the parts without changing the operation of the mechanism will not render the claims patentable and the placement of the mechanism is an obvious matter of design choice. In re Japikse, 181 F.2d 1019, 86 USPQ 70 (CCPA 1950); In re Kuhle, 526 F.2d 553, 188 USPQ 7 (CCPA 1975). On page 8 of the specification, the Applicants have described different projection orientations, which indicates that the orientation of the projections are design of choice and could be rearranged base on the desired product.

The Applicant have repeatedly asserted that Yasuo and Yoshiyushi teach away from each other, in which Yasuo teaches increasing contacting surface and Yoshiyushi teaches minimizing the contact area. However, these references are related to two different things. While in Yoshiyushi having tapered mold walls to facilitate the removal of the product from one end to the other, the tapered wall does not really teach minimizing the contact area. If the contact area between the block and the projections are limited, the blocks will not be formed properly. The material could getting loose and the formed projections on the block surface would not replicated the shape the projections on the mold wall. Yasuo, on the other hand, teaches that the projections

having slant surfaces to increase the contacting surface at each projection so that less compression force is required. Thus, Yasuo and Yoshiyushi concern about two different limitations, and these limitations are not teaching away from each other.

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thu Khanh T. Nguyen whose telephone number is 571-272-1136. The examiner can normally be reached on Monday- Friday, 6:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wanda L Walker can be reached on 571-272-1151. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TN

ROBERT DAVIS
PRIMARY EXAMINER
GROUP ~~1300~~ 1700

8/6/04

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/091,039	03/04/2002	James Hammer	1342-61338	6479

7590 12/01/2004

One World Trade Center
Suite 1600
121 S.W. Salmon Street
Portland, OR 97204

EXAMINER	
NGUYEN, THUKHANH T	

ART UNIT	PAPER NUMBER
1722	

DATE MAILED: 12/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Advisory Action	Application No.	Applicant(s)	
	10/091,039	HAMMER ET AL.	
	Examiner	Art Unit	
	Thu Khanh T. Nguyen	1722	

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 15 November 2004 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE. Therefore, further action by the applicant is required to avoid abandonment of this application. A proper reply to a final rejection under 37 CFR 1.113 may only be either: (1) a timely filed amendment which places the application in condition for allowance; (2) a timely filed Notice of Appeal (with appeal fee); or (3) a timely filed Request for Continued Examination (RCE) in compliance with 37 CFR 1.114.

PERIOD FOR REPLY [check either a) or b)]

a) ☒ The period for reply expires 3 months from the mailing date of the final rejection.

b) ☐ The period for reply expires on: (1) the mailing date of this Advisory Action, or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.
ONLY CHECK THIS BOX WHEN THE FIRST REPLY WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

1. ☐ A Notice of Appeal was filed on _____. Appellant's Brief must be filed within the period set forth in 37 CFR 1.192(a), or any extension thereof (37 CFR 1.191(d)), to avoid dismissal of the appeal.

2. ☒ The proposed amendment(s) will not be entered because:

   (a) ☒ they raise new issues that would require further consideration and/or search (see NOTE below);

   (b) ☐ they raise the issue of new matter (see Note below);

   (c) ☐ they are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or

   (d) ☒ they present additional claims without canceling a corresponding number of finally rejected claims.

   NOTE: *see attachment*.

3. ☐ Applicant's reply has overcome the following rejection(s): _____.

4. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).

5. ☐ The a)☐ affidavit, b)☐ exhibit, or c)☐ request for reconsideration has been considered but does NOT place the application in condition for allowance because: _____.

6. ☐ The affidavit or exhibit will NOT be considered because it is not directed SOLELY to issues which were newly raised by the Examiner in the final rejection.

7. ☒ For purposes of Appeal, the proposed amendment(s) a)☒ will not be entered or b)☐ will be entered and an explanation of how the new or amended claims would be rejected is provided below or appended.

   The status of the claim(s) is (or will be) as follows:

   Claim(s) allowed: _____.

   Claim(s) objected to: _____.

   Claim(s) rejected: *1-39 and 52*.

   Claim(s) withdrawn from consideration: *40-51 and 53*.

8. ☐ The drawing correction filed on _____ is a)☐ approved or b)☐ disapproved by the Examiner.

9. ☐ Note the attached Information Disclosure Statement(s)(PTO-1449) Paper No(s). _____.

10. ☐ Other: _____

DETAILED ACTION

1. The proposed amendment has introduced new issue into the claim, in which the apparatus is used for forming a roughened surface texture on an uncured masonry block. This new limitation would require further consideration.

2. Applicant's arguments filed November 15, 2004 have been fully considered but they are not persuasive.

3. In response to applicant's argument that there is no suggestion to combine Yoshiyuki and Yasuo, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Yoshiyuki discloses an apparatus for forming concrete block having a plurality of projects on its surface, while Yasuo discloses a concrete block having a plurality of conical projections on its surface to improve the integrity (firmness, firm adherence; Merriam-Webster's Dictionary 10th Ed. 1998) of the concrete block. Because both references are related to the forming of concrete blocks, they are combinable.

4. When the projections are conical, or having a slant surface of the pyramidal shape, the firmness of the concrete block is improved. Therefore, it would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify Yoshiyuki by

providing the projections having conical shape in order to form concrete block having conical projections on its surface as taught by Yasuo.

It has also been well known in the molding art that the molded product takes the shape of the mold; therefore in order to form a product having conical projections on its surface, the mold surface should also have conical projections. Therefore, when incorporate the conical projections, or projections with slant surfaces as taught by Yasuo into Yoshiyuki, it's no more than just a shape modification. The operation of Yoshiyuki remains the same. There is no invention in merely changing the shape or form of an article without changing its function except in a design patent. See Eskimo Pie Corp. v. Levous et al., 3 USPQ 23 and In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966)

5. In response to applicant's argument that Yasuo is nonanalogous art, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, Yasuo is related to the concrete block having conical projections on its surface, while Yoshiyuki and the current invention are related to an apparatus for forming concrete blocks having projections on its surface. Because the shape of the final product is corresponding to the shape of the mold , it would have been obvious to a skilled artisan to change the shape of the mold in order to form a concrete block with stronger integrity, or firmness. Therefore, Yasuo is in the field of applicant's endeavor.

In regard to Applicant's argument that Yoshiyuki and Yasuo teach away from the claims, in which the reference teach "apparatus for casting a mirror image of a mold wall into the surface

of concrete, rather than an apparatus for creating a roughened surface texture on an uncured block as it is removed from a mold." As the Applicant would agree that when casting the mirror image of a mold wall into the surface of concrete, Yoshiyuki would also create a roughened surface texture on the forming block. As the examiner understand, the roughened surface or the current invention was only formed as it come into contact with the tapered projections on the mold surface during the removal of the block. However, this is a functional limitation that does not result in the differences of the apparatus. Yoshiyuki and Yasuo's mold could also form a block with conical projections on its surface, as the block is removed from an expandable mold, or a mold in which the walls are laterally removable. Therefore, the limitation on how to form the projections on the blocks cannot be used to determent patentability of an apparatus claim, when all structure limitations are taught by prior art. Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. In re Danly, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). "[A]pparatus claims cover what a device *is*, not what a device *does*." Hewlett- Packard Co. v. Bausch & Lomb Inc., 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990). (Emphasis in original)

6. The Applicant have repeatedly asserted that Yasuo and Yoshiyuki teach away from each other, in which Yasuo teaches increasing contacting surface and Yoshiyuki teaches minimizing the contact area. However, these references are related to two different things. While in Yoshiyuki having tapered mold walls to **facilitate the removal of the product** from one end to the other, the tapered wall does not really teach minimizing the contact area. If the contact area between the block and the projections are limited, the blocks will not be formed properly. The material could get loose and the formed projections on the block surface would not replicate the

shape the projections on the mold wall. Yasuo, on the other hand, teaches that the projections having slant surfaces to increase the contacting surface at each projection so that **less compression force is required**. Thus, Yasuo and Yoshiyuki concern about two different limitations, and these limitations are not teaching away from each other.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thu Khanh T. Nguyen whose telephone number is 571-272-1136. The examiner can normally be reached on Monday- Friday, 6:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin L. Utech can be reached on 571-272-1137. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TN

JAMES P. MACKEY
PRIMARY EXAMINER
11/29/04

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-191314

(43)Date of publication of application : 17.07.2001

(51)Int.Cl. B28B 3/02
B28B 7/18

(21)Application number : 2000-003825

(22)Date of filing : 12.01.2000

(71)Applicant : AKAGI SHOKAI:KK

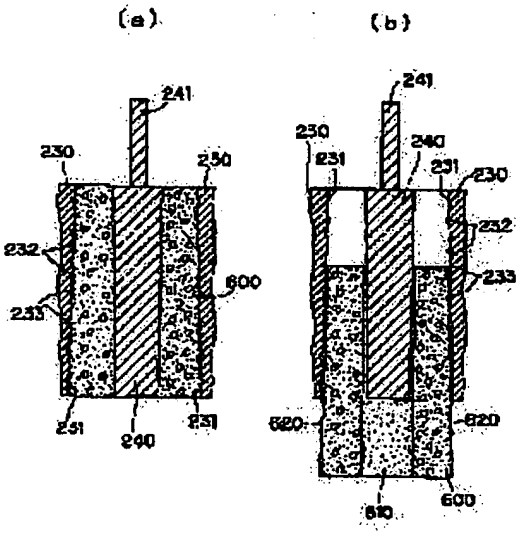
(72)Inventor : TOMIOKA YOSHIYUKI

(54) METHOD AND DEVICE FOR MANUFACTURING CONCRETE BLOCK

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a manufacturing method for a concrete block for manufacturing with good productivity the recessed and projected patterns on its surface and also provide a manufacturing device thereof.

SOLUTION: A form with a through-hole formed in the up and down direction is provided with a structure in which the interval of an inner face 231 facing a partition 230 is widened downward and a number of recesses and projections 232 and 233 are formed at least on a part of the inner face 231, and a supporting plate is disposed on the bottom face of the form, and a concrete material is filled in the form, and a plunger is inserted from an upper opening of the form to pressurize the concrete material in the form and mold the same, and the supporting plate is lowered and a molded block 600 is drawn out of the form to manufacture the concrete block having a number of random recesses and projections on its surface and provided with the outer appearance of natural hand.



LEGAL STATUS

[Date of request for examination] 10.03.2003

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to the manufacturing method and manufacturing installation of a concrete block by the instant-demolding press method.

[0002]

[Description of the Prior Art] A concrete block arranges a support plate (pallet) on the inferior surface of tongue of this mold conventionally using the mold which comes to arrange a diaphragm in parallel [at intervals of predetermined] with the interior of the frame which the upper and lower sides penetrated. After filling up with concrete material the space surrounded with said frame and diaphragm, pushing in a plunger and carrying out pressing of said concrete material, by dropping said support plate The obtained moldings is extracted from the lower part of said mold, and it is manufactured the curing after accelerated hardening and by making it harden.

[0003] However, a concavo-convex pattern is given to the surface of a concrete block, or the **** pattern of natural aesthetic property is given, what raised appearance and texture comes to be marketed, and popularity has been acquired in recent years.

[0004] In this case, in order to give the concavo-convex pattern of a predetermined configuration, the method of taking out, after recuperating oneself and slushing and stiffening concrete in the metal mold which has such a concavo-convex pattern inside is adopted.

[0005] Moreover, when making it the **** pattern of natural aesthetic property, the block of a ********-like object is fabricated for two or more blocks, and the method of breaking the connection section of this block by the splitter, and using that parting plane as the surface is adopted.

[0006]

[Problem(s) to be Solved by the Invention] However, by the method of taking out, after recuperating oneself and slushing and stiffening concrete in metal mold in order to give the concavo-convex pattern of a predetermined configuration, since time amount was taken in order to make it recuperate oneself and harden, there was a problem that productivity was remarkable and it was bad.

[0007] Moreover, by the method of breaking the connection section by the splitter and using a parting plane as the surface, after making it fabricate and harden where two or more blocks are connected, since the activity which divides a block was needed and time and effort was taken, there was a problem of becoming cost high.

[0008] Then, the purpose of this invention is to offer the manufacture method of a concrete block and manufacturing installation which enabled it to manufacture the concrete block which has a concavo-convex pattern on the surface with sufficient productivity.
[0009]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, a manufacture method of a concrete block of this invention Arrange a backing plate on a base of a mold which the upper and lower sides penetrated, it is filled up with concrete material in this mold, and a plunger is inserted from an up opening of said mold. In a manufacture method of a concrete block which concrete material in said mold is pressurized and fabricated, and said backing plate is dropped, and extracts said fabricated block from said mold It is characterized by using what was formed so that a gap of an inside which counters might go caudad and might spread as said mold, forming much irregularity in a part of this inside [at least], and forming much irregularity in the surface of a fabricated block.
[0010] When according to a manufacture method of a concrete block of this invention it is filled up with concrete material in a mold and pressurizes by plunger by having formed much irregularity in a part of inside [at least] of a mold, irregularity corresponding to irregularity of said inside is formed on the surface of mold goods. And if a backing plate is dropped, a fabricated block will be extracted from a lower opening of a mold. Although a sliding friction of a field in contact with irregularity of an inside of a mold becomes large at this time, since it is formed so that a gap of an inside which a mold counters may go caudad and may spread, if a block shifts caudad for a while, a crevice occurs between a block and an inside of a mold and it can extract comparatively easily. In this way, a concrete block which has much irregularity on the surface can be obtained by recuperating oneself and stiffening a fabricated block. In addition, if the surface is ground with irregularity of an inside of a mold in the case of stripping, random irregularity can be formed the bottom coarsely and it can be made appearance of more natural aesthetic property.
[0011] In a manufacture method of a concrete block of this invention, it is desirable to heat an inside in which said irregularity of said mold was formed on the occasion of said shaping. Pattern [that can prevent being buried with concrete material to which concrete material adhering to an inside of a mold dried, it becomes easy to exfoliate, and irregularity adhered according to this mode, and it is depended on irregularity] attachment can be performed continuously.
[0012] Moreover, it is desirable to use what is projected rather than a field in which it has a flat field and a field in which said irregularity was formed as said mold, and said flat field is located in more nearly up than a field in which said irregularity was formed, and said irregularity was formed. while a flat side cratered on the surface of a block is formed of a flat side where a mold inside projected according to this mode, it is ******** from the above-mentioned flat side -- since a field which has irregularity projected on the surface of a block is formed of a concavo-convex field, a block equipped with a field which is rich in change which has a flat side and a field to which irregularity was made can form.
[0013] Moreover, a manufacturing installation of a concrete block of this invention A mold which has a frame which the upper and lower sides penetrated, and a diaphragm

arranged in parallel [at intervals of predetermined] with the interior of this frame, A backing plate which is arranged possible [rise and fall] under this mold, and contacts a base of said mold possible [attachment and detachment], An inside which is equipped with a plunger inserted in each space surrounded with said frame and said diaphragm from the upper part, and said frame and said dashboard counter It is characterized by being formed so that those gaps may go caudad and may spread, and forming much irregularity in said a part of inside [at least].

[0014] According to the manufacturing installation of a concrete block of this invention, it can be filled up with concrete material in a mold, it can pressurize with a plunger, and a block can be fabricated. Since much irregularity is formed in a part of inside [at least] of a mold at this time, irregularity corresponding to this irregularity can be fabricated on the surface of a fabricated block. Moreover, a backing plate is dropped, and since it is formed so that a gap of an inside which a mold counters may go caudad and may spread in case a fabricated block is extracted from a mold, if a block shifts caudad for a while, a crevice will occur between a block and an inside of a mold. Therefore, a sliding friction by contact to a block and irregularity of an inside of a mold becomes small, and can extract a block comparatively easily from a mold.

[0015] In a manufacturing installation of a concrete block of this invention, it is desirable that a heater for heating an inside in which said irregularity was formed to said mold is formed. Since it can prevent that concrete material adheres to a concavo-convex side by heating and drying at a heater an inside in which irregularity was formed according to this mold, it is stabilized and pattern [that it calls at a concavo-convex field] attachment can be performed continuously.

[0016] Moreover, it is desirable to have projected rather than a portion in which an inside in which said irregularity was formed has a flat portion and a portion in which said irregularity was formed, and said flat portion is in more nearly up than a portion in which said irregularity was formed, and said irregularity was formed.

[0017] According to this mode, a block equipped with a field which is rich in change which has a flat side and a field to which irregularity was made can be formed.

[0018]

[Embodiment of the Invention] One operation gestalt of the manufacturing installation of the concrete block by this invention is shown in drawing 1 -6. The perspective diagram in which drawing 1 shows an important section general view of this equipment, the perspective diagram in which drawing 2 shows an overall general view of this equipment, the plan of the mold with which drawing 3 is used for this equipment, the perspective diagram of the diaphragm with which drawing 4 is used for this equipment, the sectional side elevation in which drawing 5 (a) shows the condition in front of mold omission of a block, the sectional side elevation in which drawing 5 (b) shows the condition in the middle of without [of a block] a mold, and drawing 6 are the perspective diagrams of the

[0019] As shown in drawing 1 , the principal part of the manufacturing installation 100 of this concrete block consists of a mold 200 and a plunger 300.

[0020] The mold 200 consists of the frame 210 which has a opening 220 in the center, two or more diaphragms 230 arranged so that a opening 220 might be divided, and two or more cores 240 which were supported by the support plate 241 and arranged between the insides 231 of this diaphragm 230. Moreover, the outside of a frame 210 is equipped with

the eccentric weight 250.
[0021] As shown in drawing 4 , a diaphragm 230 consists of plate-like part material to which thickness is becoming thin gradually toward the bottom, and many heights 232 and crevices 233 are established in the surface of the inclined inside 231. And as shown in drawing 3 , in case this diaphragm 230 is arranged in a opening 220, it arranges in parallel mutually at intervals of predetermined so that the inside 231 of each diaphragm 230 may counter. In addition, what is necessary is to be good for the surface of an inside 231 to also form much heights 232, and just to establish a crevice 233 in it if needed [, such as a design of the wall surface of a product,]. Furthermore, it is necessary to form heights 232 in no insides 231 of two or more above-mentioned diaphragms 230 that what is necessary is to just be prepared at least in one side of the inside 231 which counters. Moreover, the height of heights 232 or the depth of a crevice 233 has 2-7 desirablemm.
[0022] Said core 240 consists of a pillar-shaped member which has the same height as a frame 210, and is put in order and arranged by the longitudinal direction of a diaphragm 230 between said insides 231 which counter. And about the upper limit section, it is supported by the support plate 241 longer than the width of face of a opening 220, and is in the condition of having been hung in the opening 220. In addition, although the configuration of a core 240 has the shape of the abbreviation square pole which rounded off the corner, it may make the configuration a cylindrical configuration that what is necessary is just what has the same height as a frame 210. Moreover, the block which omits a core and does not have a cavity in the interior may be fabricated.
[0023] As shown in drawing 1 , said eccentric weight 250 consists of plate-like part material of two or more sheets of the same configuration arranged at intervals of predetermined, and each plate-like part material is making the circle of a radius with bigger nothing and other-end section than it for the circle of a radius with one small edge, and it is carrying out the shape of a plan type like a pear as a whole. And the shaft 251 has penetrated in the location near the edge where the radius of the eccentric weight 250 is small which carried out eccentricity. Furthermore, this shaft 251 penetrates a frame 210, is supported pivotable, and the pulley 252 formed in that edge is connected with the driving means which is not illustrated through a belt 253, and it constitutes the oscillating means of a mold 200 from this driving means, a belt 253, a pulley 252, a shaft 251, and eccentric weight 250.
[0024] Said plunger 300 consists of two or more hand plates 310. This hand plate 310 is plate-like part material which has the shape of a plan type which can be inserted in the opening between said cores 240 and insides 231 which were put in order and arranged, that top end face is connected with other hand plates 310, it is united, and the bottom end face is a clamping plane 311.
[0025] Said mold 200 is attached possible [vibration] to the pedestal which is not illustrated, and said plunger 300 is arranged in the upper part. Moreover, as shown in drawing 2 , a stationary plate 430 is attached in the plunger 300 bottom, and this stationary plate 430 is being further fixed to the supporter 420 arranged in that upper part. The supporter 420 is attached possible [a vertical slide] to said pedestal through the stanchion 410 arranged in the both sides. Moreover, an oil hydraulic cylinder 400 can be connected with the location of inside approach for a while from the stanchion 410 of supporter 420 both sides, and a supporter 420, a stationary plate 430, and a plunger 300 can be moved now to one in the vertical direction to a mold 200 by this oil hydraulic

cylinder 400.
[0026] The backing plate 510 which contacts the lower part of said mold 200 possible [attachment and detachment on the base of a mold 200] is arranged, and the conveyor 500 is further formed in the lower part. If conveyed just under a frame 200 in the condition of having been laid in the conveyor 500, a backing plate 510 will be lifted by rise-and-fall means which is not illustrated by which this conveyor 500 was formed caudad, and a pressure welding will be carried out to the base of a mold 200, and it will be lowered after block shaping termination to the location laid in a conveyor 500. In addition, although the block 600 extracted from the mold 200 is laid in the backing plate 510 after block shaping termination, this block 600 is conveyed by conveyor 500, while it had been laid in the backing plate 510.
[0027] Furthermore, this ****** moves right above a mold 200, and the manufacturing installation 100 of this concrete block is filled up with concrete material in a mold 200, when it has ****** which is not illustrated and a plunger 300 is pushed up to the topmost part. After being filled up with concrete material in a mold 200, the above-mentioned ****** retreats to the location which does not interfere in descent of a plunger 300.
[0028] Next, if the manufacturing installation 100 of this concrete block explains how to manufacture a concrete block, a plunger 300 will be first pushed up to a position by the oil hydraulic cylinder 400. Moreover, the backing plate 510 conveyed just under a mold 200 by conveyor 500 is lifted with the rise-and-fall means which is not illustrated, and the base of a mold 200 is made it to carry out a pressure welding. And ****** which is not illustrated is moved to the mold 200 bottom, and a mold 200 is filled up with concrete material. In addition, as concrete material, the thing of the common knowledge which contains cement, the aggregates, such as sand and a stone, and water, for example is used. In this case, a moisture content is adjusted so that a block object can be fabricated by pressurization. After being filled up with concrete material, as mentioned above, ****** is retreated to the location which does not interfere in descent of a plunger.
[0029] Next, a pulley 252 is rotated through a belt 253 by the driving means. At this time, the eccentric weight 250 fixed to a shaft 251 and this shaft 251 also rotates. And when the center of gravity of eccentric weight is distant from the shaft 251, a mold 200 vibrates by the reaction and the interior of a mold 200 is uniformly filled up with concrete material.
[0030] Then, an oil hydraulic cylinder 400 is operated, a supporter 420, a stationary plate 430, and a plunger 300 are dropped to one, the clamping plane 311 of a plunger 300 is inserted between a core 240 and an inside 231, and concrete material is pressurized. Concrete material is hardened by this and block 600 is fabricated.
[0031] Here, the block 600 in a mold 200 has the heights 232 prepared in the inside 231 of a diaphragm 230 in the condition that a part of wall surface 620 ate into interlocking and a crevice 233 at the wall surface 620, as shown in drawing 5 (a). From this condition, if only a few lowers the backing plate 510 and plunger 300 of a mold 200, while a wall surface 620 is scratched by heights 232, that crowning is deleted and the portion which ate into the crevice 233 is processed into unevenness coarse as a whole, block 600 will be shifted by the bottom. Then, since the gap of inside 231 is spreading gradually toward the bottom, as it is shown in drawing 5 (b), a crevice is formed between a wall surface 620 and an inside 231. In this condition, since heights 232, a wall surface 620, or the lobe and inside 231 of a wall surface 620 that were formed of the crevice 233 do not contact, if only the backing plate 510 is lowered, it will be in the condition that the block 600 was

laid in the backing plate 510, and will be extracted from a mold 200 after it.
[0032] In addition, if the heater which heats a diaphragm 230 is formed in case block 600 is extracted from a mold 200, since it can make it able to dry immediately and the concrete material adhering to the inside 231 of a diaphragm 230 can be made to exfoliate, it can prevent that concrete material remains adhering to an inside 231, and irregularity is no longer formed in the case of the following block shaping.
[0033] After that, the block 600 extracted from the mold 200 is lowered to the location laid in a conveyor 500 with a backing plate 510, and is conveyed by conveyor 500 in a predetermined location. And it is recuperated at the conveyance place and it becomes the concrete block 700 as shown in drawing 6 . Since much irregularity is formed in that wall surface 720, this concrete block 700 is what presented the appearance which has natural aesthetic property.
[0034] Moreover, in the manufacturing installation 100 of the above-mentioned concrete block, a diaphragm 230 is only replaced with and the configuration of block 600 can be changed if needed. For example, the concrete block 800 as shown in drawing 8 can be manufactured by using the diaphragm 260 as shown in drawing 7 instead of the above-mentioned diaphragm 230.
[0035] The diaphragm 260 shown in drawing 7 has the inside 261 which consists of a concavo-convex field 263 in which heights 264 and a crevice 265 were formed, and a flat side 262 projected through the level difference 266 to this concavo-convex side 263. In this case, to the concavo-convex field 263, the flat side 262 is arranged up and made into the configuration in which mold omission is possible. In addition, the thickness of a diaphragm 260 is thinly formed as it goes caudad, and the concavo-convex field 263 and the flat side 262 are the inclined plane which spreads as the gap of the diaphragm 260 which counters goes caudad. It makes it easy to extract the fabricated block caudad by this.
[0036] As shown in drawing 8 , the wall surface 820 of the concrete block 800 manufactured using the above-mentioned diaphragm 261 has the flat side 821 and the concavo-convex field 822, and the concavo-convex field 822 is making the configuration which the block 800 set caudad and was projected from the flat side 821. Therefore, the block which was rich in change of appearance can be acquired.
[0037] In addition, as long as it has an inclined plane where the gap of the diaphragm which has much irregularity in a part of the inside [at least], and counters it turns caudad, and spreads, the thing of various configurations can be used for the configuration of the diaphragm of the manufacturing installation of the concrete block by this invention.
[0038]
[Effect of the Invention] As explained above, when according to this invention it is filled up with concrete material in a mold and pressurizes by the plunger by having formed much irregularity in a part of inside [at least] of a mold, the block which has the irregularity of a large number corresponding to the irregularity of said inside on the surface can be formed. Moreover, if a block shifts caudad for a while by forming the gap of the inside which a mold counters so that it may go caudad and may spread, a crevice occurs between a block and the inside of a mold, and the sliding friction by contact to a block and the irregularity of the inside of a mold becomes small, and can extract a block comparatively easily from a mold. And the concrete block of the natural aesthetic

property which has many concavo-convex patterns on the surface can be manufactured with sufficient productivity by recuperating oneself and stiffening the block extracted from the mold, without needing the activity which divides a block.

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号
特開2001－191314
(P2001－191314A)
(43)公開日　平成13年７月17日(2001.7.17)

(51)Int.Cl.⁷	識別記号	Ｆ Ｉ		テーマコード(参考)
Ｂ２８Ｂ　3/02		Ｂ２８Ｂ　3/02	Ｊ	４Ｇ０５３
7/18		7/18		４Ｇ０５４

審査請求　未請求　請求項の数６　ＯＬ　（全７頁）

(21)出願番号　特願2000－3825(P2000－3825)

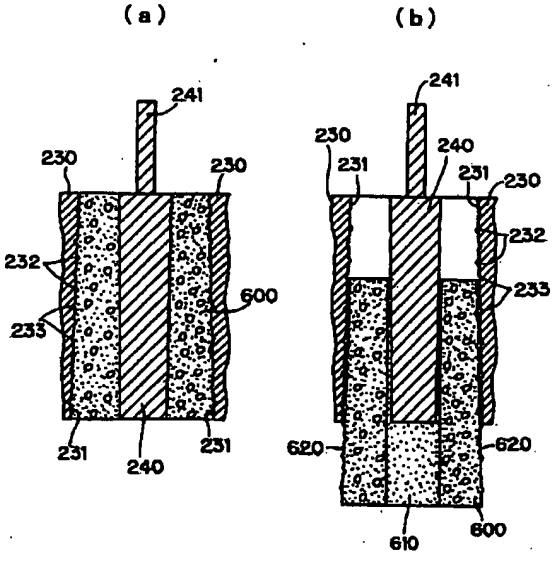
(22)出願日　平成12年１月12日(2000.1.12)

(71)出願人　591172906
株式会社赤城商会
群馬県北群馬郡子持村大字吹屋1093番地４
(72)発明者　富岡　義之
群馬県北群馬郡子持村大字吹屋1093番地４
株式会社赤城商会内
(74)代理人　100086689
弁理士　松井　茂

Ｆターム(参考)　4G053 AA07 BA04 BC03 BE04 BF01
BF04 EA02 EA47 EB03 EB06
4G054 AA01 AA18 AB08 AC01 BA02
BA62 BA74

(54)【発明の名称】　コンクリートブロックの製造方法及び製造装置

(57)【要約】
【課題】　凹凸模様を表面に有するコンクリートブロックを生産性よく製造できるようにしたコンクリートブロックの製造方法及び製造装置を提供する。
【解決手段】　仕切り板２３０の対向する内面２３１の間隔が下方に向かって広がり、この内面２３１の少なくとも一部に多数の凹凸２３２，２３３が形成されてなる上下が貫通した型枠を用い、この型枠の底面に受け板を配置し、この型枠内にコンクリート材を充填し、プランジャーを前記型枠の上部開口から挿入して、前記型枠内のコンクリート材を加圧して成形し、前記受け板を下降させて前記成形されたブロック６００を前記型枠から抜き出すことにより、表面にランダムな多数の凹凸を有し、自然な風合いの外観を呈するコンクリートブロックを製造する。



1

【特許請求の範囲】

【請求項1】　上下が貫通した型枠の底面に受け板を配置し、この型枠内にコンクリート材を充填し、プランジャーを前記型枠の上部開口から挿入して、前記型枠内のコンクリート材を加圧して成形し、前記受け板を下降させて前記成形されたブロックを前記型枠から抜き出すコンクリートブロックの製造方法において、前記型枠として、対向する内面の間隔が下方に向かって広がるように形成されたものを使用し、この内面の少なくとも一部に多数の凹凸を形成して、成形されたブロックの表面に多数の凹凸を形成することを特徴とするコンクリートブロックの製造方法。

【請求項2】　前記成形に際して、前記型枠の前記凹凸が形成された内面を加熱しておく請求項1記載のコンクリートブロックの製造方法。

【請求項3】　前記型枠として、平坦な面と前記凹凸が形成された面とを有し、前記平坦な面は、前記凹凸が形成された面よりも上方にあって、かつ、前記凹凸が形成された面よりも突出しているものを用いる請求項1又は2に記載のコンクリートブロックの製造方法。

【請求項4】　上下が貫通した枠体と、この枠体の内部に所定間隔で平行に配置された仕切り板とを有する型枠と、

この型枠の下方に昇降可能に配置され、前記型枠の底面に接離可能に当接する受け板と、

前記枠体及び前記仕切り板で囲まれたそれぞれの空間に上方から挿入されるプランジャとを備え、

前記枠体及び前記仕切板の対向する内面は、それらの間隔が下方に向かって広がるように形成され、かつ、前記内面の少なくとも一部に多数の凹凸が形成されていることを特徴とするコンクリートブロックの製造装置。

【請求項5】　前記型枠には、前記凹凸が形成された内面を加熱するためのヒータが設けられている請求項4記載のコンクリートブロックの製造装置。

【請求項6】　前記凹凸が形成された内面は、平坦な部分と前記凹凸が形成された部分とを有し、前記平坦な部分は、前記凹凸が形成された部分よりも上方にあって、かつ、前記凹凸が形成された部分よりも突出している請求項4又は5記載のコンクリートブロックの製造装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、即時脱型プレス方式による、コンクリートブロックの製造法及び製造装置に関するものである。

【0002】

【従来の技術】従来、コンクリートブロックは、上下が貫通した枠体の内部に所定間隔で平行に仕切り板を配置してなる型枠を用い、この型枠の下面に支持板（パレット）を配置して、前記枠体及び仕切り板で囲まれた空間にコンクリート材を充填し、プランジャーを押し込んで

2

前記コンクリート材を加圧成形した後、前記支持板を下降させることによって、得られた成形物を前記型枠の下方から抜き、その後養生、硬化させることによって製造されている。

【0003】ところが、近年、コンクリートブロックの表面に凹凸模様を施したり、自然な風合いの石肌模様を施したりして、外観や質感を高めたものが市販されるようになり、人気を得ている。

【0004】この場合、所定形状の凹凸模様を施すには、そのような凹凸模様を内面に有する金型内にコンクリートを流し込み、養生、硬化させた後に取出す方法が採用されている。

【0005】また、自然な風合いの石肌模様にする場合には、複数のブロックを連結した状体のブロックを成形し、このブロックの連結部をスプリッターで割ってその分割面を表面とする方法が採用されている。

【0006】

【発明が解決しようとする課題】しかしながら、所定形状の凹凸模様を施すため、金型内にコンクリートを流し込み、養生、硬化させた後に取出す方法では、養生、硬化させるために時間がかかるため、生産性が著しく悪いという問題があった。

【0007】また、複数のブロックを連結した状態で成形し、硬化させた後、連結部をスプリッターで割って分割面を表面とする方法では、ブロックを分割する作業が必要となり、手間がかかるため、コスト高となるという問題があった。

【0008】そこで、本発明の目的は、凹凸模様を表面に有するコンクリートブロックを生産性よく製造できるようにしたコンクリートブロックの製造方法及び製造装置を提供することにある。

【0009】

【課題を解決するための手段】上記目的を達成するため、本発明のコンクリートブロックの製造方法は、上下が貫通した型枠の底面に受け板を配置し、この型枠内にコンクリート材を充填し、プランジャーを前記型枠の上部開口から挿入して、前記型枠内のコンクリート材を加圧して成形し、前記受け板を下降させて前記成形されたブロックを前記型枠から抜き出すコンクリートブロックの製造方法において、前記型枠として、対向する内面の間隔が下方に向かって広がるように形成されたものを使用し、この内面の少なくとも一部に多数の凹凸を形成して、成形されたブロックの表面に多数の凹凸を形成することを特徴とする。

【0010】本発明のコンクリートブロックの製造方法によれば、型枠の内面の少なくとも一部に多数の凹凸を形成したことによって、コンクリート材を型枠内に充填し、プランジャーで加圧したときに、前記内面の凹凸に対応する凹凸が成形品の表面に形成される。そして、受け板を下降させると、成形されたブロックが型枠の下部

開口から抜き出される。このとき、型枠の内面の凹凸に接触する面の摺動抵抗は大きくなるが、型枠の対向する内面の間隔が下方に向かって広がるように形成されているので、ブロックが少し下方にずれると、ブロックと型枠の内面との間に隙間が発生し、比較的容易に抜き出すことができる。こうして成形したブロックを養生、硬化させることにより表面に多数の凹凸を有するコンクリートブロックを得ることができる。なお、脱型の際に、型枠の内面の凹凸によって表面が擦られるようにすれば、ざらざらしたランダムな凹凸を形成することができ、より自然な風合いの外観にすることができる。

【0011】本発明のコンクリートブロックの製造方法においては、前記成形に際して、前記型枠の前記凹凸が形成された内面を加熱しておくことが好ましい。この態様によれば、型枠の内面に付着したコンクリート材が乾燥して剥離しやすくなり、凹凸が付着したコンクリート材で埋まってしまうことを防止でき、凹凸による模様付けを継続して行うことができる。

【0012】また、前記型枠として、平坦な面と前記凹凸が形成された面とを有し、前記平坦な面は、前記凹凸が形成された面よりも上方にあって、かつ、前記凹凸が形成された面よりも突出しているものを用いることが好ましい。この態様によれば、型枠内面の突出した平坦面によって、ブロックの表面にへこんだ平坦面が形成されると共に、上記平坦面よりもひっこんだ凹凸面によって、ブロックの表面に突出した凹凸を有する面が形成されるので、平坦面と凹凸に仕上げられた面とを有する変化に富む面を備えたブロックを形成することができる。

【0013】また、本発明のコンクリートブロックの製造装置は、上下が貫通した枠体と、この枠体の内部に所定間隔で平行に配置された仕切り板とを有する型枠と、この型枠の下方に昇降可能に配置され、前記型枠の底面に接離可能に当接する受け板と、前記枠体及び前記仕切り板で囲まれたそれぞれの空間に上方から挿入されるプランジャとを備え、前記枠体及び前記仕切板の対向する内面は、それらの間隔が下方に向かって広がるように形成され、かつ、前記内面の少なくとも一部に多数の凹凸が形成されていることを特徴とする。

【0014】本発明のコンクリートブロックの製造装置によれば、コンクリート材を型枠内に充填し、プランジャで加圧してブロックを成形することができる。このとき、型枠の内面の少なくとも一部に多数の凹凸が形成されているので、成形されたブロックの表面にこの凹凸に対応する凹凸を成形することができる。また、受け板を下降させ、成形されたブロックを型枠から抜き出す際、型枠の対向する内面の間隔が下方に向かって広がるように形成されているので、ブロックが少し下方にずれると、ブロックと型枠の内面との間に隙間が発生する。そのため、ブロックと型枠の内面の凹凸との接触による摺動抵抗が小さくなり、ブロックを型枠から比較的容易に抜き出すことができる。

【0015】本発明のコンクリートブロックの製造装置において、前記型枠には、前記凹凸が形成された内面を加熱するためのヒータが設けられていることが好ましい。この型枠によれば、凹凸が形成された内面をヒーターで加熱し乾燥させることにより、コンクリート材が凹凸面に付着するのを防止できるので、凹凸面による模様付けを安定して連続的に行うことができる。

【0016】また、前記凹凸が形成された内面は、平坦な部分と前記凹凸が形成された部分とを有し、前記平坦な部分は、前記凹凸が形成された部分よりも上方にあって、かつ、前記凹凸が形成された部分よりも突出していることが好ましい。

【0017】この態様によれば、平坦面と凹凸に仕上げられた面とを有する変化に富む面を備えたブロックを形成することができる。

【0018】

【発明の実施の形態】図1～6には、本発明によるコンクリートブロックの製造装置の一実施形態が示されている。図1は本装置の要部概観を示す斜視図、図2は本装置の全体的な概観を示す斜視図、図3は同装置に用いられる型枠の平面図、図4は同装置に用いられる仕切り板の斜視図、図5（a）はブロックの型抜き前の状態を示す側断面図、図5（b）はブロックの型抜きの途中の状態を示す側断面図、図6は製造されたコンクリートブロックの斜視図である。

【0019】図1に示すように、このコンクリートブロックの製造装置100の主要部は、型枠200とプランジャ300とから構成されている。

【0020】型枠200は、中央に開口220を有するフレーム210と、開口220を仕切るように配設された複数の仕切り板230と、この仕切り板230の内面231の間に支持板241により支持され配設された複数の中子240とからなっている。また、フレーム210の外側には偏心ウエイト250を備えている。

【0021】図4に示すように、仕切り板230は下側に向かって徐々に肉厚が薄くなっている板状部材からなり、傾斜している内面231の表面には多数の凸部232及び凹部233が設けられている。そして、図3に示すように、この仕切り板230を開口220に配設する際は、各々の仕切り板230の内面231が対向するように、所定間隔で互いに平行に配設する。なお、内面231の表面には、多数の凸部232が設けられているだけでもよく、凹部233は、例えば製品の壁面のデザインなどの必要に応じて設ければよい。更に、凸部232は対向する内面231の少なくとも一方に設けられていればよく、上記複数の仕切り板230の全ての内面231に設けなくともよい。また、凸部232の高さ又は凹部233の深さは2～7mmが好ましい。

【0022】前記中子240は、フレーム210と同じ

高さを有する柱状部材からなり、前記対向する内面２３１の間に、仕切り板２３０の長手方向に並べて配設されている。そして、その上端部を、開口２２０の幅より長い支持板２４１に支持され、開口２２０の中に吊された状態となっている。なお、中子２４０の形状は、角部を丸めた略四角柱状であるが、その形状は、フレーム２１０と同じ高さを有するものであればよく、例えば円柱などの形状にしてもよい。また、中子を省略して内部に空洞のないブロックを成形してもよい。

【００２３】図１に示すように、前記偏心ウエイト２５０は、所定間隔で配列された同じ形状の複数枚の板状部材からなり、各板状部材は、一方の端部が小さな半径の円弧をなし、他方の端部がそれよりも大きな半径の円弧をなしていて、全体として洋梨のような平面形状をしている。そして、偏心ウエイト２５０の半径の小さな端部に近い偏心した位置にシャフト２５１が貫通している。更に、このシャフト２５１は、フレーム２１０を貫通して回転可能に支持され、その端部に設けられたプーリ２５２はベルト２５３を介して図示しない駆動手段に連結され、この駆動手段と、ベルト２５３と、プーリ２５２と、シャフト２５１と、偏心ウエイト２５０とで型枠２００の振動手段を構成している。

【００２４】前記プランジャ３００は、複数の押板３１０から構成されている。この押板３１０は、前記並べて配設された中子２４０と内面２３１との間の空隙に挿入できる平面形状を有する板状部材であり、その上側端面は他の押板３１０と連結されて一体となっており、下側端面は押面３１１となっている。

【００２５】前記型枠２００は、図示しない基台に対し振動可能に取り付けられ、前記プランジャ３００はその上方に配設されている。また、図２に示すように、プランジャ３００の上側には固定板４３０が取り付けられ、更に、この固定板４３０はその上方に配設された支持部４２０に固定されている。支持部４２０は、その両側に配設された支柱４１０を介して、前記基台に対し上下スライド可能に取り付けられている。また、支持部４２０両側の支柱４１０より少し内寄りの位置には油圧シリンダ４００が連結され、この油圧シリンダ４００によって、支持部４２０、固定板４３０、プランジャ３００を一体に、型枠２００に対して上下方向に動かすことができるようになっている。

【００２６】前記型枠２００の下方には、型枠２００の底面に接離可能に当接する受け板５１０が配置され、更にその下方にはコンベア５００が設けられている。受け板５１０は、コンベア５００に載置された状態で枠体２００の真下に搬送されてくると、このコンベア５００の下方に設けられた図示しない昇降手段により持ち上げられ、型枠２００の底面に圧接され、ブロック成形終了後、コンベア５００に載置する位置まで下げられるようになっている。なお、ブロック成形終了後の受け板５１０には、型枠２００から抜き出されたブロック６００が載置されるが、このブロック６００は受け板５１０に載置されたままコンベア５００により搬送される。

【００２７】更に、本コンクリートブロックの製造装置１００は、図示しない給材箱を備えており、プランジャ３００が最上部まで押上げられた際に、この給材箱が型枠２００の真上に移動して、型枠２００内にコンクリート材を充填するようになっている。型枠２００内にコンクリート材を充填した後、上記給材箱は、プランジャ３００の下降に干渉しない位置まで後退する。

【００２８】次に、このコンクリートブロックの製造装置１００により、コンクリートブロックを製造する方法について説明すると、まず、油圧シリンダ４００によりプランジャ３００を所定の位置まで押し上げる。また、コンベア５００により型枠２００の真下に搬送されてきた受け板５１０を、図示しない昇降手段により持ち上げ、型枠２００の底面に圧接させる。そして、図示しない給材箱を型枠２００の上側に移動させて、型枠２００にコンクリート材を充填する。なお、コンクリート材としては、例えばセメントと、砂、石等の骨材と、水とを含有する周知のものが使用される。この場合、加圧によってブロック体が成形できるように水分量を調整する。コンクリート材を充填した後、前述したように給材箱はプランジャの下降に干渉しない位置まで後退させる。

【００２９】次に、駆動手段により、ベルト２５３を介してプーリ２５２を回転させる。このとき、シャフト２５１とこのシャフト２５１に固定された偏心ウエイト２５０も回転する。そして、偏心ウエイトの重心がシャフト２５１から離れていることにより、その反作用で型枠２００が振動し、コンクリート材が型枠２００の内部にまんべんなく充填される。

【００３０】続いて、油圧シリンダ４００を作動させて、支持部４２０、固定板４３０、プランジャ３００を一体に下降させ、プランジャ３００の押面３１１を中子２４０と内面２３１の間に挿入し、コンクリート材を加圧する。これによって、コンクリート材が固められ、ブロック６００が成形される。

【００３１】ここで、型枠２００の中のブロック６００は、図５（ａ）に示すように、仕切り板２３０の内面２３１に設けられた凸部２３２が壁面６２０に食い込み、又、凹部２３３には壁面６２０の一部が食い込んだ状態にある。この状態から、型枠２００の受け板５１０とプランジャ３００とを少しだけ下げると、壁面６２０は凸部２３２に引っかかれるとともに、凹部２３３に食い込んだ部分はその頂部が削られ、全体として粗い凸凹に加工されながら、ブロック６００が下側にずらされる。すると、内面２３１どうしの間隔は下側に向かって徐々に広がっていることから、図５（ｂ）に示すように、壁面６２０と内面２３１との間に隙間が形成される。この状態においては、凸部２３２と壁面６２０、或いは凹部２

３３により形成された壁面６２０の突出部と内面２３１とが接触することはないので、それ以降は受け板５１０のみを下げていけば、ブロック６００が受け板５１０に載置された状態で、型枠２００から抜き出される。

【００３２】なお、ブロック６００を型枠２００から抜き出す際、仕切り板２３０を加熱するヒーターを設けておけば、仕切り板２３０の内面２３１に付着したコンクリート材を即時に乾燥させて剥離させることができるので、コンクリート材が内面２３１に付着したままになって、次のブロック成形の際に凹凸が形成されなくなることを防止できる。

【００３３】型枠２００から抜き出されたブロック６００は、その後、受け板５１０とともにコンベア５００に載置される位置まで下げられ、コンベア５００により所定の場所に搬送される。そして、その搬送先で養生され、図６に示すような、コンクリートブロック７００となる。このコンクリートブロック７００は、その壁面７２０に多数の凹凸が形成されているので、自然の風合いを有する外観を呈したものとなっている。

【００３４】また、上記コンクリートブロックの製造装置１００においては、仕切り板２３０を代えるだけで、ブロック６００の形状を必要に応じて変えることができる。例えば、上記仕切り板２３０の代わりに、図７に示されるような仕切り板２６０を使用することにより、図８に示されるようなコンクリートブロック８００を製造することができる。

【００３５】図７に示す仕切り板２６０は、凸部２６４及び凹部２６５が形成された凹凸面２６３と、この凹凸面２６３に対して段差２６６を介して突出した平坦面２６２とからなる内面２６１を有している。この場合、凹凸面２６３に対して、平坦面２６２は上方に配置され、型抜きが可能な形状とされている。なお、仕切り板２６０の肉厚は下方に向かうに従って薄く形成され、凹凸面２６３及び平坦面２６２は、対向する仕切り板２６０の間隔が下方に向かうに従って広がるような傾斜面となっている。これによって、成形されたブロックを下方に抜き出すことを容易にしている。

【００３６】図８に示すように、上記仕切り板２６１を使用して製造したコンクリートブロック８００の壁面８２０は、平坦面８２１と、凹凸面８２２とを有し、凹凸面８２２は、ブロック８００の下方において平坦面８２１から突出した形状をなしている。したがって、外観の変化に富んだブロックを得ることができる。

【００３７】なお、本発明によるコンクリートブロックの製造装置の仕切り板の形状は、その内面の少なくとも一部に多数の凹凸を有し、かつ、対向する仕切り板の間隔が下方に向けて広がるような傾斜面を有するものである限り、各種形状のものが採用可能である。

【００３８】

【発明の効果】以上説明したように、本発明によれば、型枠の内面の少なくとも一部に多数の凹凸を形成したことによって、コンクリート材を型枠内に充填し、プランジャーで加圧したときに、前記内面の凹凸に対応する多数の凹凸を表面に有するブロックを形成することができる。また、型枠の対向する内面の間隔を下方に向かって広がるように形成することによって、ブロックが少し下方にずれると、ブロックと型枠の内面との間に隙間が発生し、ブロックと型枠の内面の凹凸との接触による摺動抵抗が小さくなり、ブロックを型枠から比較的容易に抜き出すことができる。そして、型枠から抜き出したブロックを養生、硬化させることにより、ブロックを分割する作業などを必要とせずに、多数の凹凸模様を表面に有する自然な風合いのコンクリートブロックを生産性よく製造できる。

【図面の簡単な説明】

【図１】本製造装置の要部概観を示す斜視図である。

【図２】本製造装置の全体的な概観を示す斜視図である。

【図３】同装置に用いられる型枠の平面図である。

【図４】同装置に用いられる仕切り板の斜視図である。

【図５】ブロックの型抜き前の状態（ａ）、及び型抜きの途中の状態（ｂ）を示す側断面図である。

【図６】製造されたコンクリートブロックの一実施形態を示す斜視図である。

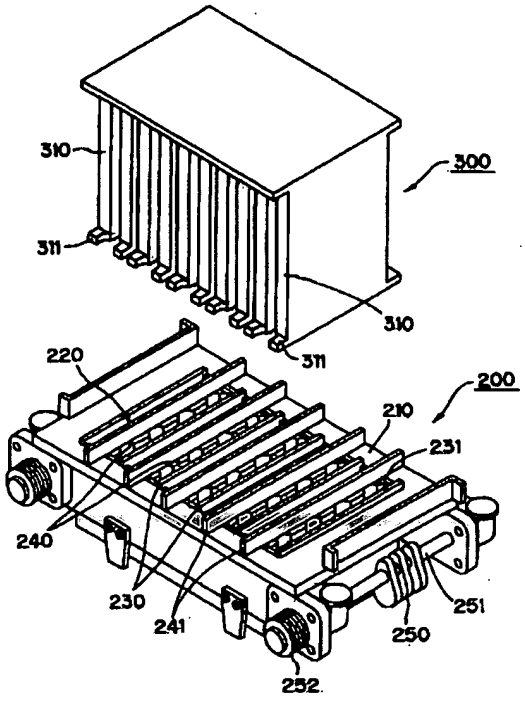
【図７】仕切り板の他の実施形態を示す斜視図である。

【図８】製造されたコンクリートブロックの他の実施形態を示す斜視図である。

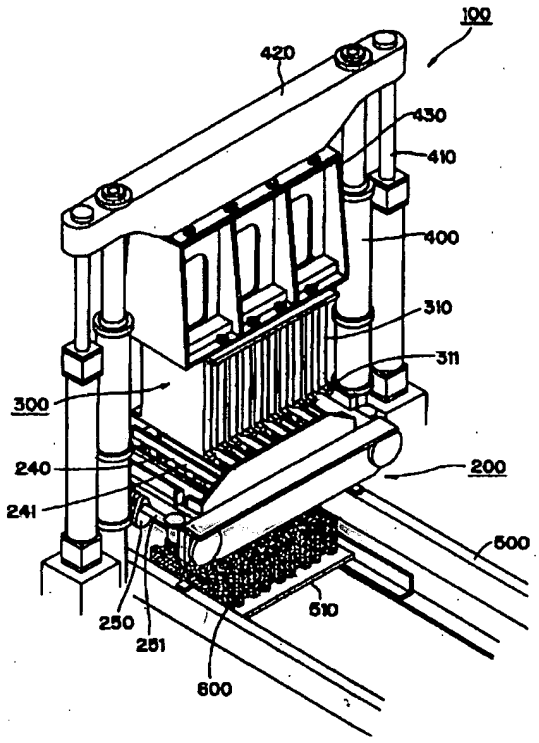
【符号の説明】

１００　コンクリートブロックの製造装置
２００　型枠
２３０　仕切り板
２４０　中子
２５０　偏心ウエイト
３００　プランジャー
４００　油圧シリンダ
５００　コンベア
６００　ブロック
７００　コンクリートブロック

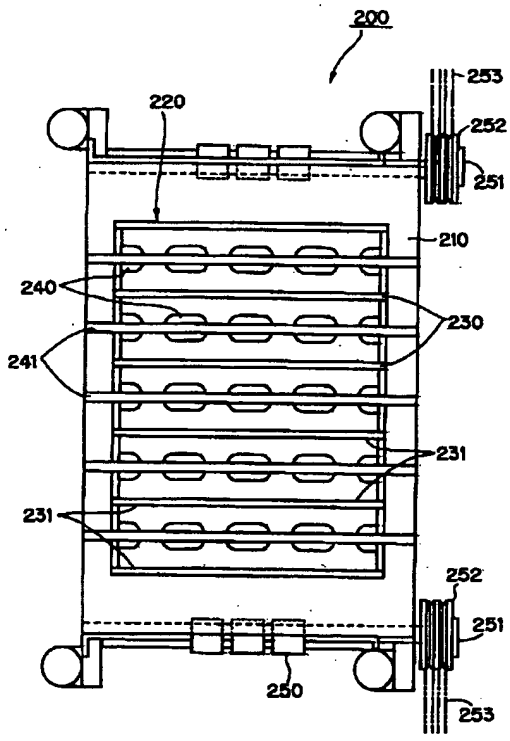
【図1】


310
300
311
310
311
220
200
210
231
240
230
241
251
250
252

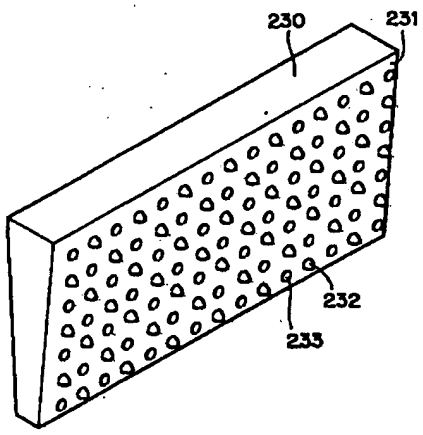
【図2】


100
420
430
410
400
310
311
300
240
241
200
500
510
250
251
600

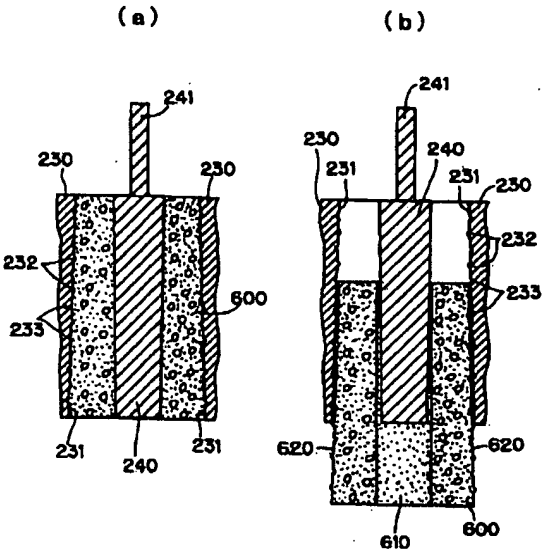
【図3】


200
253
220
252
251
210
240
230
241
231
231
252
251
250
253

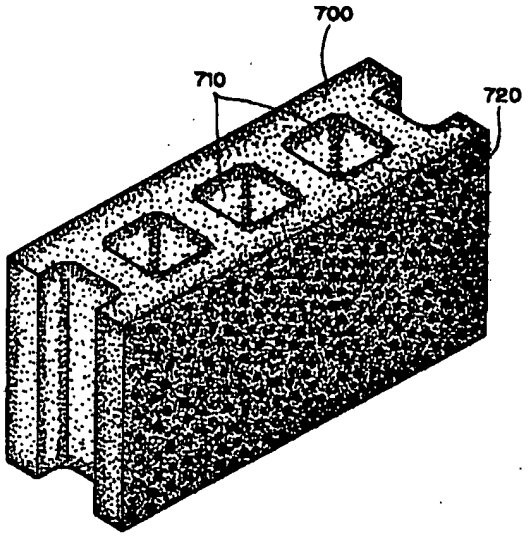
【図4】


230
231
232
233

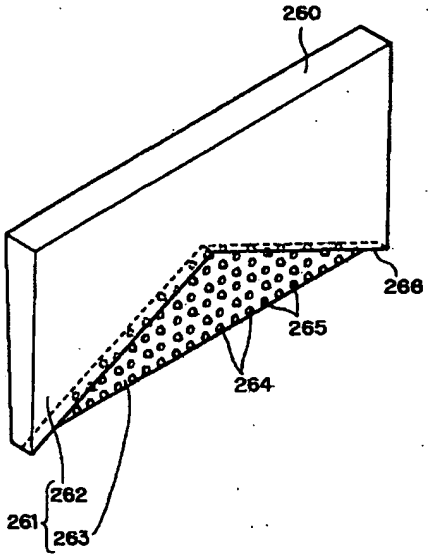
【図5】


(a)
(b)
241
230
230
232
233
600
231
240
231
241
230
231
240
231
230
232
233
620
620
610
600

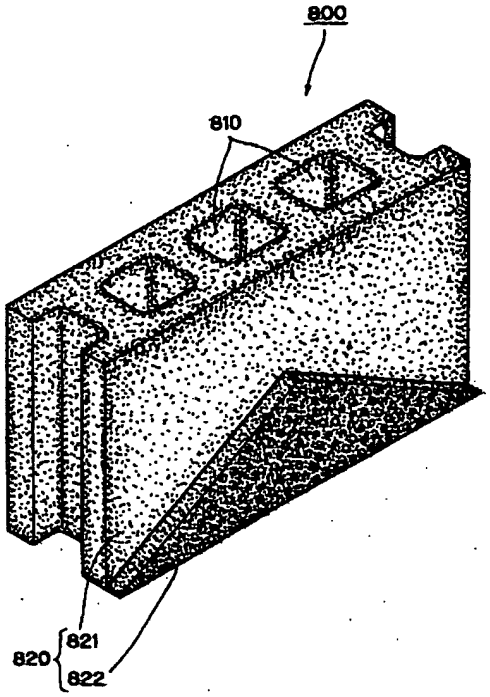
【図6】


700
710
720

【図7】


260
266
265
264
262
261
263

【図8】


800
810
820
821
822

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 07-052133

(43)Date of publication of application : 28.02.1995

(51)Int.Cl. B28B 7/34
B28B 7/00
E04B 1/16

(21)Application number : 05-200780

(22)Date of filing : 12.08.1993

(71)Applicant : KAJIMA CORP

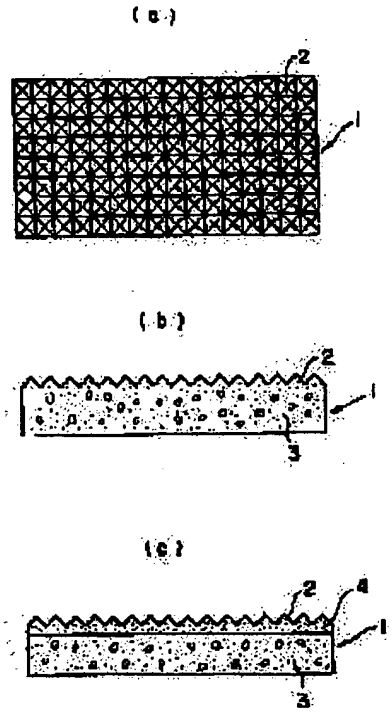
(72)Inventor : MURAYAMA YASUO
SUDA KUMIKO
ICHINOMIYA TOSHIMICHI
SHINPO HIROSHI

(54) EMBEDDING FORM MADE OF PRECAST CONCRETE

(57)Abstract:

PURPOSE: To enhance the integrality with main body concrete by providing conical projections to the almost entire surface on the side of main body concrete.

CONSTITUTION: An embedding form 1 made of precast concrete is formed by densely providing regular quadrangular pyramid shaped projections 2 to the surface of enabedding form concrete 3. The projections 2 are composed of high compression strength cement mortar and the angle formed by the slope and bottom surface of the regular quadrangular pyramid is set to about 45°. The embedding form made of precast concrete can be easily produced by casting the embedding form concrete 3 into a manufacturing form having reinforcing rods arranged thereto and pressing the press form having regular quadrangular recessed parts carved therein to the surface of the embedding form concrete 3 before the start of curing and transferring the recessed parts to the embedding form concrete 3. By this constitution, the integrality with main body concrete can be enhanced.



LEGAL STATUS

(19)日本国特許庁（ＪＰ）　(12) 公開特許公報（A）　(11)特許出願公開番号

特開平7－52133

(43)公開日　平成７年(1995)２月28日

(51)Int.Cl.⁶		識別記号	庁内整理番号	ＦＩ	技術表示箇所
Ｂ２８Ｂ	7/34	D			
	7/00	Z			
Ｅ０４Ｂ	1/16	C	7121－2E		

審査請求　未請求　請求項の数４　ＯＬ　（全４頁）

(21)出願番号　特願平5－200780

(22)出願日　平成５年(1993)８月12日

(71)出願人　000001373
鹿島建設株式会社
東京都港区元赤坂１丁目２番７号

(72)発明者　村山　八洲雄
東京都調布市飛田給２丁目19番１号　鹿島建設株式会社技術研究所内

(72)発明者　須田　久美子
東京都調布市飛田給２丁目19番１号　鹿島建設株式会社技術研究所内

(72)発明者　一宮　利通
東京都調布市飛田給２丁目19番１号　鹿島建設株式会社技術研究所内

(74)代理人　弁理士　久門　知　（外１名）

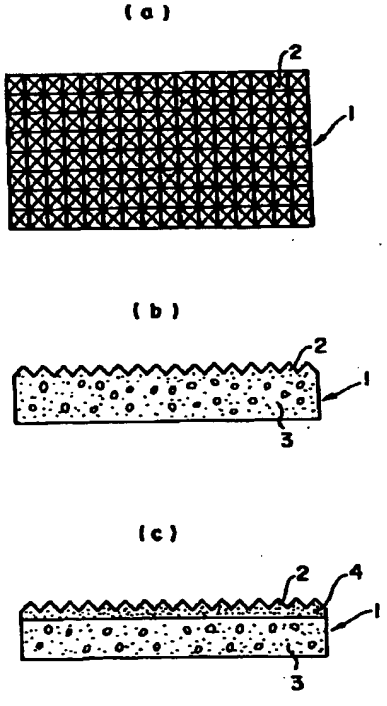
最終頁に続く

(54)【発明の名称】　プレキャストコンクリート製埋設型枠

(57)【要約】

【目的】　プレキャストコンクリート製埋設型枠と本体コンクリートとの一体性を向上させる。

【構成】　プレキャストコンクリート製埋設型枠の本体コンクリート側表面に斜面が平面もしくは外側に凸の曲面である正多角錐体状の突起を密に設ける。



1

【特許請求の範囲】
【請求項1】　内面側表面の略全面に正多角錐体状もしくは正多角錐台状の突起を設けたことを特徴とするプレキャストコンクリート製埋設型枠。
【請求項2】　内面側表面の略全面に斜面が平面でなく外側に凸の曲面である正多角錐体状もしくは正多角錐台状の突起を設けたことを特徴とするプレキャストコンクリート製埋設型枠。
【請求項3】　本体コンクリートの圧縮強度の1．5倍以上の圧縮強度を有するコンクリートを使用して製造した請求項1および請求項2記載のプレキャストコンクリート製埋設型枠。
【請求項4】　突起の材料が埋設型枠コンクリートおよび本体コンクリートの何れよりも高い圧縮強度を有するセメントモルタルである請求項1～請求項3記載のプレキャストコンクリート製埋設型枠。
【発明の詳細な説明】
【0001】
【産業上の利用分野】本発明は、本体コンクリート側表面の略全面に、斜面が平面もしくは外側に凸の曲面である正多角錐体状または正多角錐台状（以下錐体または錐体状と総称する。）の突起を設けた本体コンクリートとの一体性の高いプレキャストコンクリート製埋設型枠に関するものである。
【0002】
【従来の技術】プレキャストコンクリート製埋設型枠は、コンクリート構造物の施工において、施工の急速化や省力化ひいては経済化のために使用されているが、その際、当然のことながら本体コンクリートとの一体性が出来るだけ高いものが望まれる。
【0003】この要望に応える方策として、次のような方法で埋設型枠の本体コンクリート側表面に凹凸加工を施している。
【0004】（1）コンクリートの硬化後チッピングするなどして凹凸を作る。
【0005】（2）コンクリートの未硬化の段階でサンドブラストなどの方法で粗骨材を露出させて凹凸を作る。
【0006】（3）コンクリートの未硬化の段階で粗骨材を移植して凹凸を作る。
【0007】（4）コンクリート埋設型枠を製造するための専用型枠表面に凹凸を設けておき、この凹凸を埋設型枠表面に転写する。
【0008】
【発明が解決しようとする課題】上記（1）～（3）の方法では、作業に多くの手間と時間を要するのみでなく、表面形状の一定したプレキャストコンクリート埋設型枠を定常的に製造することは不可能に近い。上記（4）の方法による場合、一般に完成後の構造物の美観の観点から本体コンクリートの反対側の面に平滑な製造

2

用専用型枠が使用されるので、特殊の場合を除き、埋設型枠の本体コンクリート側表面は製造用専用型枠の押さえ型枠側（上面側）にならざるを得ない。この押さえ型枠として凹凸を施した通常のものを使用すると、凹凸部がまばらで凹部の面積が凸部の面積に比して著しく小さく、かつ、凹凸の形状の円柱や角柱状の単純なものしか製造できず、本体コンクリートとの一体性は劣ったものである。
【0009】
【課題を解決するための手段】本発明は、本体コンクリート側表面の略全面に錐体状の突起を設けて本体コンクリートとの一体性を高くしたプレキャストコンクリート製埋設型枠である。
【0010】本発明で正多角錐というのは、正三角錐、正四角錐、正六角錐を意味する。正三角錐、正四角錐、正六角錐であればその底面は連続しており、間に隙間を生ずることなく連続して錐体状の突起を設けることができるからである。連続して錐体状の突起を設けることができればプレキャストコンクリート製埋設型枠表面の略全面に密に突起を設けることが可能となる。突起は出来れば全面に密に設けるのが好ましいが、製造用専用型枠の押さえ型枠の端に対応する箇所とか数枚の小型枠を連結して大型枠としたものを使用する際の小型枠の継ぎ目に対応する箇所とかでは突起の欠落は避けられない。
【0011】突起の錐体の斜面と底面との角度は40～50°とするのが好ましい。斜面が曲面の場合は曲面を平面と想定してその斜面と底面との角度は40～50°とするのが好ましい。
【0012】本発明のプレキャストコンクリート製埋設型枠は従来の凹凸表面をもつ埋設型枠に比して本体コンクリートとの接触面積が　かに大きくなっているのみでなく、接触面がいろんな方向に向いているので接合部での剪断応力をいろんな方向に分散させることができるので、剪断耐力を大きく向上させることができる。
【0013】いま、突起部での埋設型枠コンクリートと本体コンクリートとの接合を考えると、錐体の斜面が平面の場合、突起の剪断面積は底面からの距離の2乗に反比例して急激に小さくなる。一方、本体コンクリートの断面積は突起頂部から底面に進むに従って小さくはなるが、その程度は突起の剪断面積の減少に比して　かに緩慢である。そのため、埋設型枠コンクリートの強度と本体コンクリートの強度とが同じであると接合部の剪断破壊が埋設型枠コンクリート側で先行して起こるので全体としてのコンクリート構造物の剪断耐力は小さいものとなる。従って、この場合、埋設型枠コンクリートとして本体コンクリートより強度のより大きいものを使用して全体としてのコンクリート構造物の剪断耐力を向上させることが好ましい。錐体の斜面が曲面の場合は平面の場合に比して高強度化の程度を緩和することができる。
【0014】突起の錐体の形状が正多角錐体である場合

は当然頂部に応力が集中する。この応力集中による障害が考えられる場合には、頂部を一部切断した台形として接触面積を犠牲にして応力集中を避ける。

【００１５】本発明において、埋設型枠コンクリートに製造用専用型枠で突起を形成する際、コンクリート表面に直接突起を形成しようとすると、粗骨材の影響やコンクリートの付着などで希望の形状に突起を形成できない場合がある。その時の改善策として埋設型枠コンクリートの上にセメントモルタル層を設けておき、そのセメントモルタル層に製造用専用型枠で突起を形成すればよい。このセメントモルタル層の圧縮強度が小さいと前述のような欠点が表れるのでセメントモルタルの圧縮強度は埋設型枠コンクリートおよび本体コンクリートの何れよりも高いことが必要となる。

【００１６】

【実施例】以下図面を参照しながら本発明を説明する。

【００１７】図１は本発明のプレキャストコンクリート製埋設型枠の一例を示し、（ａ）は一部平面図、（ｂ）は一部立面図である。（ｃ）は埋設型枠コンクリートの上にセメントモルタル層を設けた一部立面図である。

【００１８】プレキャストコンクリート製埋設型枠１は埋設型枠コンクリート３の表面に正四角錐形の突起２が密に設けられている。正四角錐体の斜面と底面との角度はほぼ４５°である。プレキャストコンクリート製埋設型枠１は補強筋（図示せず）が配筋された製造用型枠内に埋設型枠コンクリート３を打設し、硬化を始める前に埋設型枠コンクリート３の表面に正四角錐形の凹みが刻まれている押さえ型枠を押しつけ凹凸を埋設型枠コンクリート３に転写することで容易に製造される。

【００１９】（ｃ）に示すように埋設型枠コンクリート

３上にセメントモルタル層４を設けると押さえ型枠による突起２の形成が容易になる。この場合は埋設型枠コンクリート３を打設した後、その上に高圧縮強度セメントモルタル層４を所定の厚さに打設し、硬化を始める前にセメントモルタル層４に押さえ型枠を押しつける。

【００２０】図２は他の形状の突起２を密に設けたプレキャストコンクリート製埋設型枠１を示す一部平面図である。図２（ａ）の例では正四角錐形の突起２が表面に密に設けられており、図２（ｂ）の例では正六角錐形の突起２が表面に密に設けられている。何れの場合も錐体の斜面と底面との角度はほぼ４５°である。

【００２１】

【発明の効果】突起形状が正多角錐体であるのでその底面は連続しており、間に隙間を生ずることなく連続して突起を設けることができ、プレキャストコンクリート製埋設型枠表面と本体コンクリートとの接触面積を大きくすることができ両者の一体性が向上する。また、接触面がいろんな方向に向いているので接合部での剪断応力をいろんな方向に分散させることができるので、剪断耐力を大きく向上させることができる。

【図面の簡単な説明】

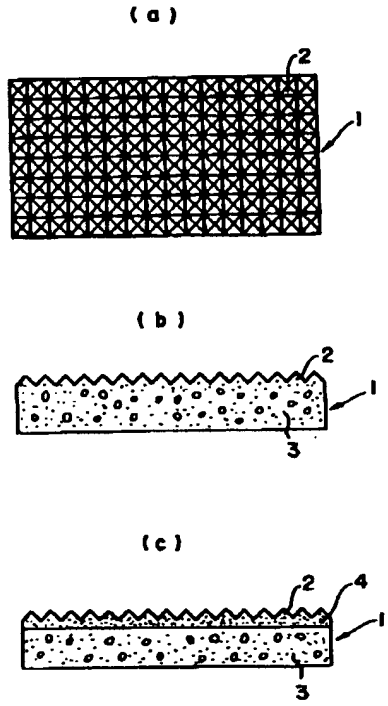
【図１】本発明のプレキャストコンクリート製埋設型枠の一例を示し、（ａ）は一部平面図、（ｂ）、（ｃ）は一部立面図である。

【図２】本発明のプレキャストコンクリート製埋設型枠の他の例を示す一部平面図である。

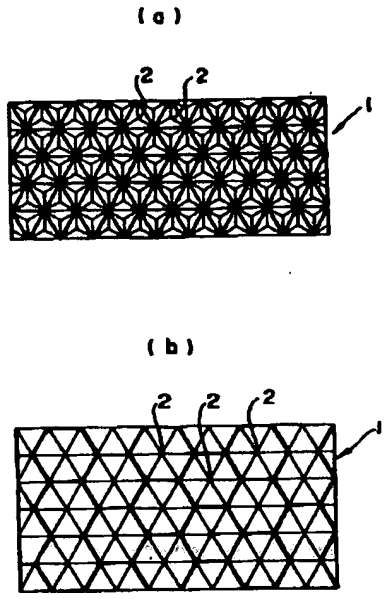
【符号の説明】

１・・プレキャストコンクリート製埋設型枠、２・・突起、３・・埋設型枠コンクリート、４・・高圧縮強度セメントモルタル層

【図1】



【図2】



フロントページの続き

(72)発明者　新保　弘
東京都調布市飛田給２丁目19番１号　鹿島
建設株式会社技術研究所内

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the high laying-under-the-ground mold made from precast concrete of integrity with the main part concrete with which the slant face prepared the shape of a positive multiple cone which is the curved surface of a convex, and a positive multiple frustum-like (it is named generically below shape of cone or cone.) projection in the plane or the outside all over the abbreviation for the main part concrete side surface.

[0002]

[Description of the Prior Art] What has as high with the laying-under-the-ground mold made from precast concrete being natural in that case although acceleration and laborsaving ****** of execution are used in execution of the concrete structure for economization integrity with main part concrete as possible is desired.

[0003] As a policy which meets this request, concavo-convex processing has been performed to the main part concrete side surface of a laying-under-the-ground mold by the following methods.

[0004] (1) Chip after hardening of concrete and make irregularity.

[0005] (2) Expose coarse aggregate by methods, such as sandblasting, in the phase where it does not harden [of concrete], and make irregularity.

[0006] (3) Transplant coarse aggregate in the phase where it does not harden [of concrete

], and make irregularity.

[0007] (4) Prepare irregularity in the exclusive mold surface for manufacturing a concrete laying-under-the-ground mold, and imprint this irregularity on the laying-under-the-ground mold surface.

[0008]

[Problem(s) to be Solved by the Invention] The above (1) It is next to impossible an activity not only to take much time and effort and time amount, but to manufacture regularly the precast concrete laying-under-the-ground mold fixed [shape's of surface type] by the method of - (3). When based on the method of the above (4), since the smooth exclusive mold for manufacture is used for the field of the opposite side of main part concrete, generally the main part concrete side surface of a laying-under-the-ground mold cannot but be from a viewpoint of the fine sight of the structure after completion on the presser-foot mold side (upper surface side) of the exclusive mold for manufacture except for the case of being special. If the usual thing which gave irregularity as this presser-foot mold is used, the concavo-convex section is sparse, the area of a crevice can manufacture only small remarkable cylinder of a concavo-convex configuration and prismatic form remarkable simple thing as compared with the area of heights, but the integrity with main part concrete is inferior.

[0009]

[Means for Solving the Problem] This invention is the laying-under-the-ground mold made from precast concrete which prepared a cone-like projection all over the abbreviation for the main part concrete side surface, and made integrity with main part concrete high.

[0010] A positive multiple drill means a positive triangular pyramid, a positive rectangular-head drill, and a positive hexagon-head drill by this invention. It is because a cone-like projection can be continuously prepared, without the base's continuing and producing a crevice in between if it is a positive triangular pyramid, a positive rectangular-head drill, and a positive hexagon-head drill. If a cone-like projection can be prepared continuously, it will become possible to prepare a projection densely all over the abbreviation for the laying-under-the-ground mold surface made from precast concrete. Although preparing in the whole surface densely is desirable as for a projection if it can

do, lack of a part corresponding to a joint of a small frame at the time of using what connected a part and a small frame of several sheets corresponding to an edge of a presser-foot mold of an exclusive mold for manufacture, and was used as a large-sized frame, or then a projection is not avoided.

[0011] As for an angle of a slant face of a cone of a projection, and a base, considering as 40-50 degrees is desirable. When a slant face is a curved surface, a curved surface is assumed to be a plane and, as for an angle of the slant face and base, considering as 40-50 degrees is desirable.

[0012] a laying-under-the-ground mold in which a laying-under-the-ground mold made from precast concrete of this invention has the conventional concavo-convex surface -- comparing -- touch area with main part concrete or -- since it is not only large, but it is suitable in the directions where the contact surface is various and shearing stress in a joint can be distributed in the various directions, shear strength can be raised greatly.

[0013] When cementation to laying-under-the-ground mold concrete in a height and main part concrete is considered now and a slant face of a cone is a plane, a shear plane product of a projection becomes small rapidly in inverse proportion to a square of distance from a base. on the other hand, the cross section of main part concrete goes to a base from a projection crowning -- although it is alike, and follows and becomes small -- the degree -- reduction of a shear plane product of a projection -- comparing -- or -- it is slow. Therefore, since shear fracture of a joint precedes that reinforcement of main part concrete is the same as reinforcement of laying-under-the-ground mold concrete by laying-under-the-ground mold concrete side and happens, shear strength of the concrete structure as the whole will become small. Therefore, it is desirable to raise shear strength of the concrete structure as the whole as laying-under-the-ground mold concrete in [concrete / main part] this case using a strong larger thing. When a slant face of a cone is a curved surface, a degree of high-intensity-izing can be eased as compared with a case of a plane.

[0014] When a configuration of a cone of a projection is a positive multiple cone, naturally stress concentrates on a crowning. When a failure by this stress concentration can be considered, it considers as a trapezoid which cut a part of crowning, and stress concentration is avoided at the sacrifice of a touch area.

[0015] In this invention, if it is going to form a direct projection in the concrete surface in case a projection is formed in laying-under-the-ground mold concrete with an exclusive mold for manufacture, a projection may be unable to be formed in a configuration of hope neither by effect of coarse aggregate, nor adhesion of concrete. What is necessary is to prepare a cement mortar layer on laying-under-the-ground mold concrete as a remedy at that time, and just to form a projection in the cement mortar layer with an exclusive mold for manufacture. Since the above defects will appear if compressive strength of this cement mortar layer is small, it is needed that compressive strength of cement mortar is higher than any of laying-under-the-ground mold concrete and main part concrete.

[0016]

[Example] This invention is explained referring to a drawing below.

[0017] Drawing 1 shows an example of the laying-under-the-ground mold made from precast concrete of this invention, (a) is a plan and a part of (b) is an elevation. [a part of] (c) prepared the cement mortar layer on laying-under-the-ground mold concrete -- it is an elevation a part.

[0018] As for the laying-under-the-ground mold 1 made from precast concrete, the projection 2 of positive rectangular-head drill type is densely formed in the surface of the laying-under-the-ground mold concrete 3. The angle of the slant face of a positive rectangular-head cone and a base is about 45 degrees. Before the laying-under-the-ground mold 1 made from precast concrete places the laying-under-the-ground mold concrete 3 in the mold for manufacture with which the reinforcement (not shown) was placed and begins hardening, it is easily manufactured by pushing the presser-foot mold with which the depression of positive rectangular-head drill type is minced by the surface of the laying-under-the-ground mold concrete 3, and imprinting irregularity to the laying-under-the-ground mold concrete 3.

[0019] If the cement mortar layer 4 is formed on the laying-under-the-ground mold concrete 3 as shown in (c), formation of the projection 2 by the presser-foot mold will become easy. In this case, after placing the laying-under-the-ground mold concrete 3, the high compressive strength cement mortar layer 4 is placed in predetermined thickness on it, and before beginning hardening, a presser-foot mold is pushed against the cement mortar layer 4.

[0020] drawing 2 shows the laying-under-the-ground mold 1 made from precast concrete which formed the projection 2 of other configurations densely -- it is a plan a part. In the example of drawing 2 (a), the projection 2 of positive rectangular-head drill type is densely formed in the surface, and the projection 2 of positive hexagon-head drill type is densely formed in the surface in the example of drawing 2 (b). In any case, the angle of the slant face of a cone and a base is about 45 degrees.

[0021]

[Effect of the Invention] Since a projection configuration is a positive multiple cone, the base can prepare a projection continuously, without continuing and producing a crevice in between, and can enlarge the touch area of the laying-under-the-ground mold surface made from precast concrete, and main part concrete, and its integrity of both improves. Moreover, since it is suitable in the directions where the contact surface is various and the shearing stress in a joint can be distributed in the various directions, shear strength can be raised greatly.